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This Week in The IRON AGE

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British and American Production Efficiency

(Cabled from London)

VISITING British industrial plants under the auspices of the Ministry of Production is both interesting and arduous. Our friends want to make sure that one sees enough to be able to draw sound conclusions. As a result the pace set is a fast one, and the survivor of such a tour should be a good candidate for additional life insurance. But out of it all a definite picture begins to emerge, and it is one that might shake the complacency of some of us at home who like to think that America has a patent on production efficiency.

It is true that we at home can outproduce, and in many instances undersell, other nations with respect to mass production products but perhaps here we are likely to confuse cause and effect. Mass production efficiency may well be the effect of the large domestic market which permits the application of mass production methods. America can produce motor cars, for example, at a much lower cost than can the British car makers, but we have a market that will absorb say five million units a year where the British market will run to 500,000. Thus there are but three continuous strip mills in the United Kingdom and, while one is projected for the postwar era, none of the existing mills are wide enough for a one-piece top stamping.

On the other hand, in machine tools, which is not a mass production proposition in any country, the British makers can produce machines of similar type and size considerably under our cost levels. The reason for this is that labor in the United Kingdom is paid for work done and not merely for time put in. Incentive systems are the rule here and the principle is accepted by the unions. In America it is the other way round.

An experienced observer can detect the presence or absence of labor efficiency by walking through a plant. There is no question whatever but that the degree of application to the task is greater on this side than back home in America.

It is a good thing that we have a home market of such size to protect us for without it the British incentive system might give us a trimming.

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the IRON AGE
October 17, 1944

NEWS FRONT

► Arrangements are now being attempted for a tremendously large bulk sale of post-war model jeeps to Russia, perhaps under some sort of lend-lease arrangements. Indications are that the Soviet Union has discussed this matter in Washington, and that soundings have been made on the subject at Willys-Overland. However, no commitments have as yet been made, it is reported.

Russia appears to be thinking in terms of need for a half million or so jeep type vehicles for internal use in agriculture and general use applications. These postwar jeeps will be quite different from the Army variety. They will necessarily have a power takeoff and will be built on a larger scale.

China is also interested in entering the postwar automobile market for about 450,000 trucks and passenger cars during the five years after Japan is beaten. However, because of China's meager transportation, many second class vehicles will be taken.

► The likelihood that Germany will last through the winter is leading to the expectation that the transition from war to peace production will be more gradual, rather than the completely abrupt shift that has figured prominently in all reconversion plans.

► In England, a number of war factories are beginning to curtail activities, with resultant discharge of workers. A growing fear there that the switch-over to other production will not be as smooth as expected, and a desire for liquidity, has resulted in a drop in British industrial equities more severe than any since 1940.

► In Russia, the Donetz Basin has just celebrated a year of liberation from Germany. Over 858 industrial units have been restored to working order, among which are 51 large mines, although many other mines of this rich coal region still are flooded.

But: The recovery of the iron ore mines at Krivoirog is proceeding very slowly, and there has been little restoration of the steel works. The government is showing no tendency to move back many of the plants from the Urals, as for instance the tank and airplane plants (Voyenzavod), which are still at Nizhny Tagil in the Urals, as is the motor plants of Stalino (which were originally built underground), and the Mariupol works (armor plate), and many other combines.

► The many skilled workers evacuated from the Donbas with their plants to the Urals, Siberia, and Central Asia have developed a natural tendency to rush back to their liberated homes.

But: Pravda has emphatically cracked down with a warning to settle down for good in their new places of habitation, as their plants will remain where they are and new units will be built in the recovered areas.

► The nickname "Father and Son" has been given to Germany's composite airplane, which is a Messerschmitt Me 109 mounted above a Junkers Ju 88. Some distance from the target the Me 109 pilot releases the Ju 88 (which carries 2 tons of explosives) and guides it to the objective by means of a radio-controlled automatic pilot.

The Allies have long been experimenting with similar remote controlling of conventional aircraft, and also rocket aircraft and rocket bombs.

And: Use by the Allies of this equipment against the Japanese is to be expected.

► Germany's V.1, the rocket bomb, was tested in Northern Italy, at Viconza, with German pilots flying captured British Spitfires attempting to destroy them in flight. The results led the Germans to estimate that not more than 10 per cent could be knocked down by aircraft.

But: Meanwhile the British had introduced the very fast Hawker Tempest fighter and their jet-propelled fighter, which accounted for far higher percentages of flying bombs casualties.

► An underground German radio has stated that during the recent attempt on Hitler's life a four-motored Messerschmitt Me 264 airplane was warmed up on Lechfeld airport to take Hitler to Japan if the rebel generals gained the upper hand.

The Me 264, which has never been mentioned before, is described as having a 6200-mile range. A similar airplane was said to have flown from Germany to Japan last year.

Electrostatic Spraying And Detearing

By HARRY FORSBERG
President, Japan Co., Cleveland

. . . Even complex metal parts now are painted automatically, economically, and with superior finish by spraying in an electrostatic field. Similar desirable results attend the electrostatic detearing of parts dipped in paint.

STRIKING success has followed the use of electrostatic processes to the finishing of metals. The ordinary methods of both spraying and dipping have obvious drawbacks.

In the usual spraying procedure, much of the material has been wasted. It has been necessary to turn the part for the paint to reach all sides, and uneven distribution of the paint film frequently results. The process of spraying in an electrostatic field has not only eliminated the above difficulties, but it has also effected a vastly improved finish of uniformity and smoothness.

In all dipping operations, the formation of tears and fatty edges is encountered. In the use of electrostatic detearing of dipped parts, a conveyer line carries the articles from the dip tank over an electrically charged grid which draws off the surplus paint and leaves the lower edges with a smooth even finish.

Both processes have found a wide range of application, are automatic in the nature of their operation, and result in a distinctly superior finish.

Electrostatic spraying has a certain similarity to electroplating, in that paint is deposited upon the work as it passes through a charged field. In both processes, the placement and deposition of material is electrically controlled. Higher potentials are used in spraying than in plating. A voltage of 100,000 or more has been found necessary to give the minute spray particles a small charge. Consequently they are attracted to the work, which has been given an opposite

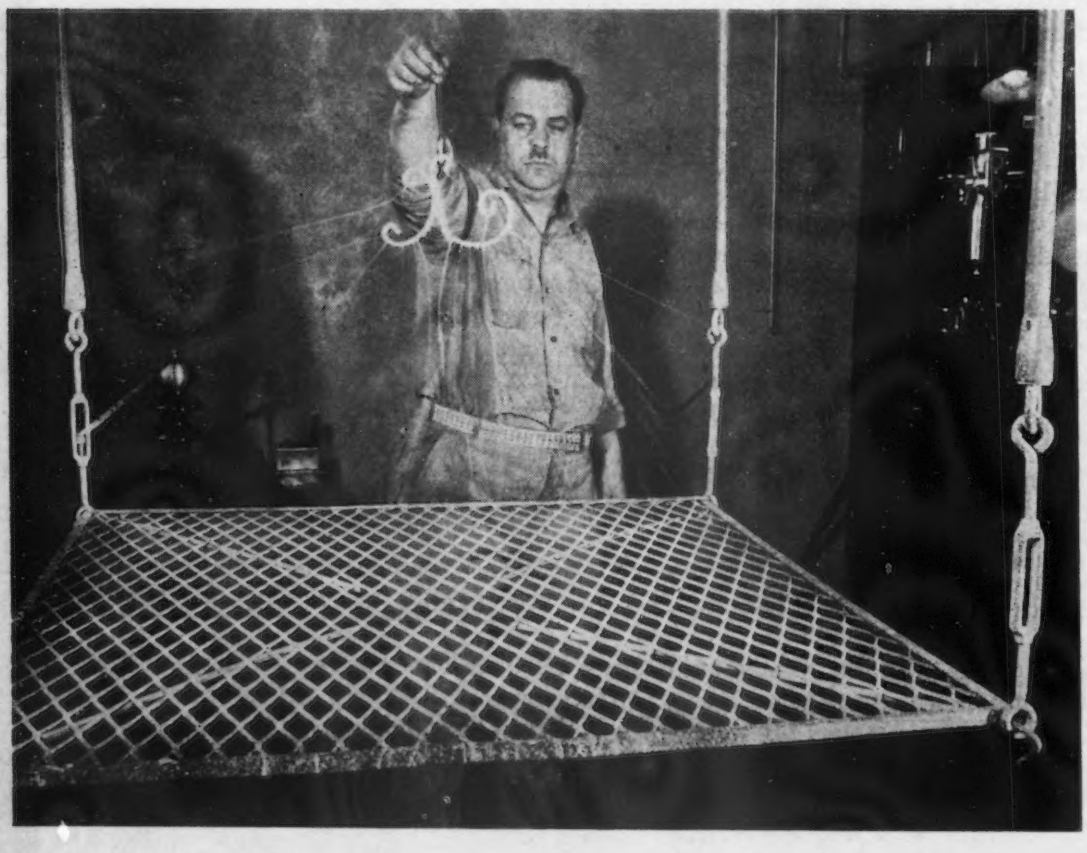


FIG. 1—A graphic illustration of the detearing process. The high-voltage grill is quite visibly drawing excess enamel from the sample part held within the electrostatic field.

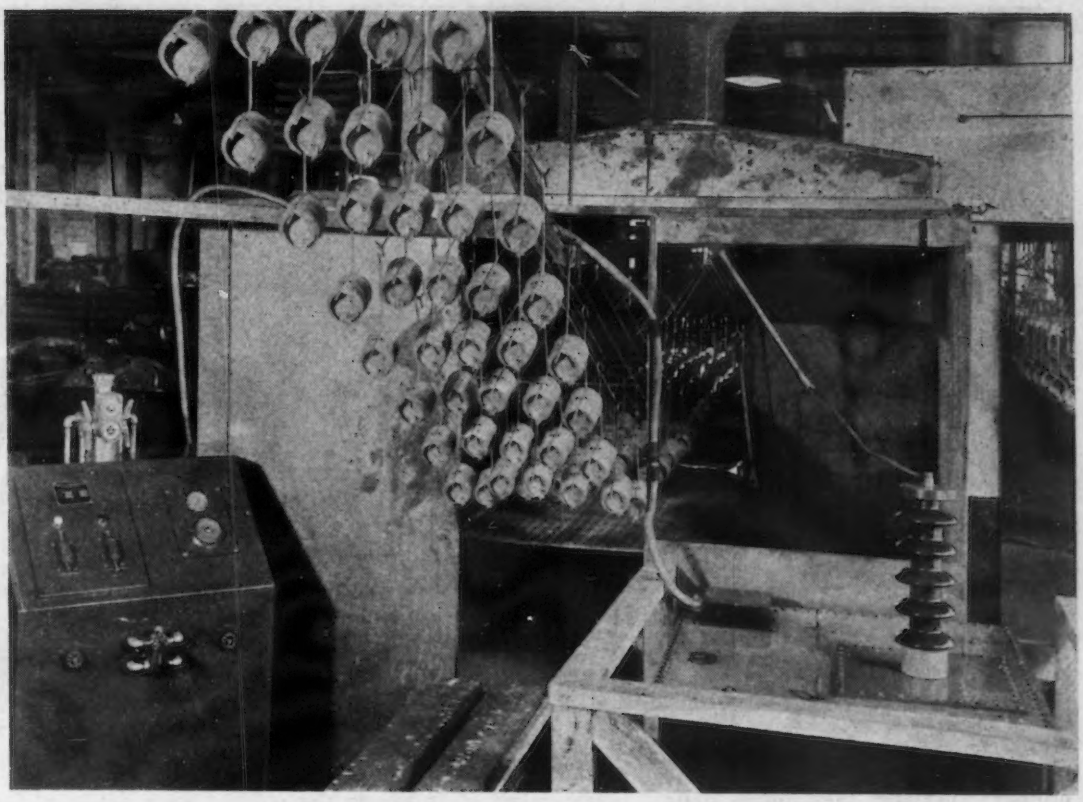


FIG. 2 — Fragmentation bomb parts passing through detearing booths in actual production. These parts have a number of tension springs and are difficult to finish without clogging the springs and creating heavy tears on the work. Now it is possible to dip and detear them, obtaining a better finish in a much shorter time with a notable saving of both manpower and money. The control panel for the electrostatic field is shown at the left and the power pack at the right of the booth exit.

polarity. The attraction of unlike charges results in the spray particles being deposited on the work with a gratifying degree of uniformity and smoothness. Wasteful overspray is virtually eliminated. This method makes possible a satisfactory spray application even to odd-shaped parts.

Electrostatic spraying is a spectacular process. The part to be sprayed is carried on a conveyer through an electrostatic field which is created by vertical electrodes, charged with 100,000 volts of electricity and located within range of a fixed spray gun. Acquiring a charge as they enter this field, the paint particles are instantly attracted to the part to be sprayed, this being grounded through its own conveyer hook. The paint is drawn to all sides of the part simultaneously, creating the appearance of a light fog of the atomized paint enveloping the piece to be coated. Somewhat better results may be obtained by revolving the part in the field, although this is not strictly necessary.

This process obviously results in increased speed of operation. For instance, consider the following example of the difference between ordinary spraying and the new electrostatic process with respect to improved production speed.

In the Japan Company's plant, a recent job was the application of two

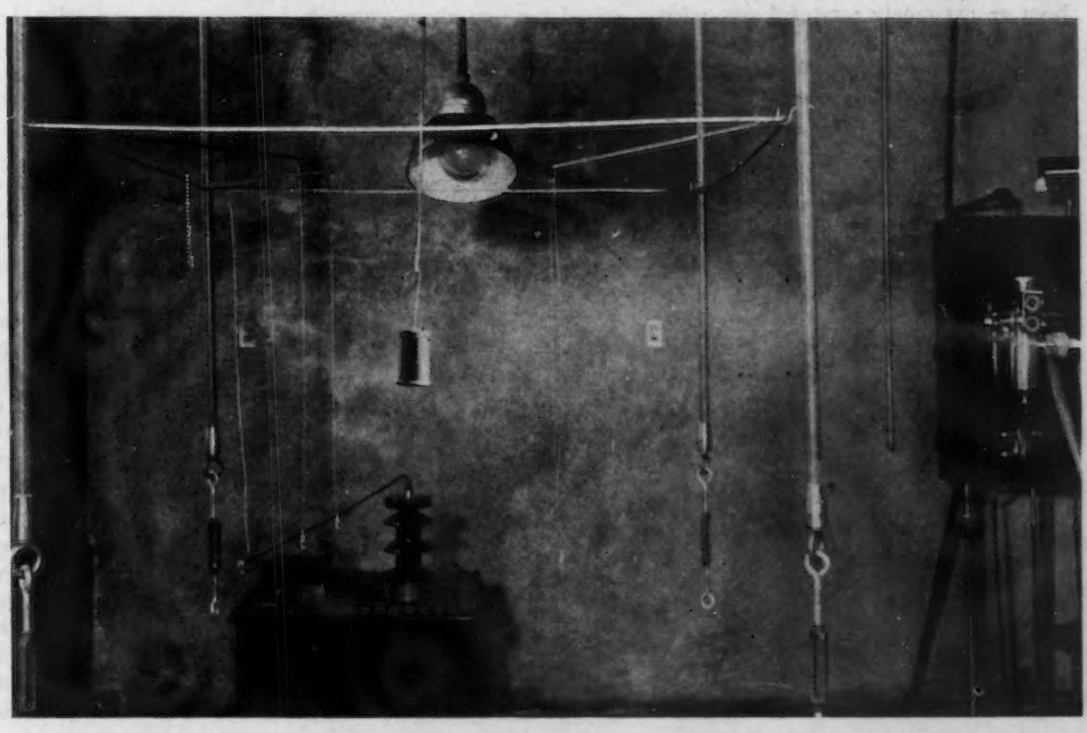


FIG. 3—The paint is being sprayed directly from the gun onto the part, and covers only one side of the part, most of the paint by-passing the part and being lost.

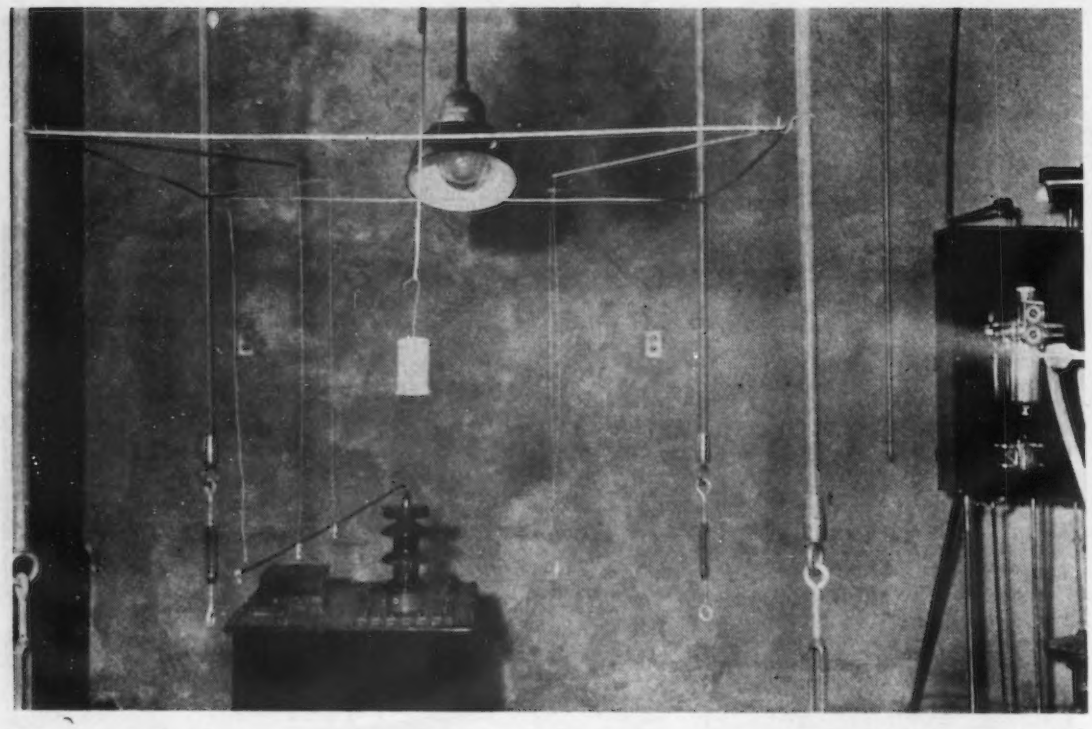


FIG. 4—Same as Fig. 3, only current has been applied and the atomized paint is seized by the electrostatic field, converted into a fine fog around the part, and is deposited evenly and smoothly upon the metal surface, using far less material and resulting in exact control of film thickness. The electrostatic field is created by the four fine wires which are hanging down. The heavy insulators with turnbuckles are the suspension hooks for the detearing grill.

coats of paint to mine housings. With ordinary spraying, these mines could be given one coat of paint at the rate of 200 an hr. Using the electrostatic spraying operation, it was possible to paint from 300 to 400 per hr. *with both coats.*

Also, the ordinary spraying process required three booths with an operator and three helpers on each booth. The electrostatic spraying operation requires only two booths with one operator and one assistant. In other words, two men using this improved process are now doing the work of 12.

The old spray process has always been an extremely wasteful one, with as much as 90 per cent of the paint wasted on some jobs. When paint is sprayed at an object, only a small part of the paint is intercepted and adheres; much of it passes the object and is wasted on the walls and floors of the spray booth. Even with the most efficient use of the ordinary spraying method, it is probably correct to say that not more than 50 per cent of the spray material is utilized.

Because the electrostatic field causes the paint particles to be drawn toward a given point, this waste is prevented. This method of painting an object is highly efficient and causes the paint to be spread more smoothly than was ever possible in the past, resulting in a greatly reduced amount of paint required for any given operation.

Thus, paint is conserved in two ways: (1) practically all the paint sprayed is deposited on the part, and (2) much less paint is required in each action of the spray gun.

Electrostatic finishing also results in a great improvement in finishing quality. In general, a thinner, more flexible paint film is applied, reducing the risk of chipping. But the most important point is that absolute control and uniformity of film thickness are made possible.

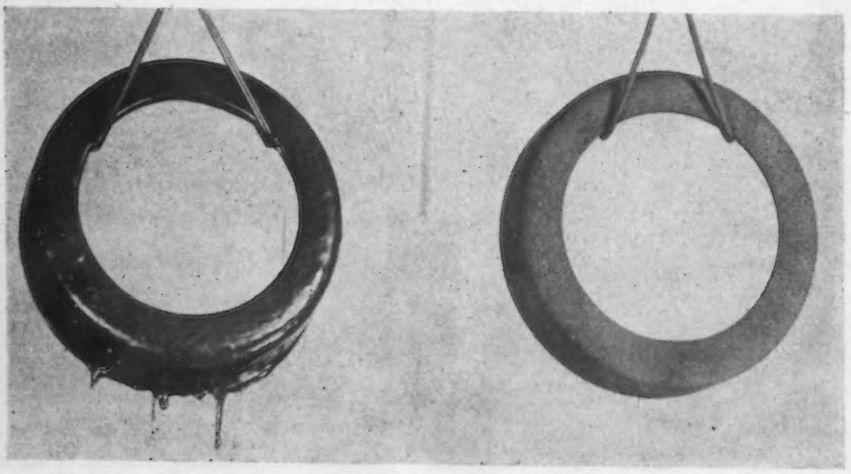
The spacing of electrodes, fluid and atomizing pressure, conveyer speed and coating process—all factors in the efficient operation of this method—must be properly correlated to obtain the best results. With these factors carefully determined, the painting process is fully automatic.

As with electroplating, the uniformity of the coating is to some extent dependent on the contours of the article to be painted. The same tendency to deposit more material on protruding surfaces and less on those which are recessed is noted. The degree of this variation depends largely on the extent to which certain sections are shielded from the electrostatic field, so there is a certain measure of control over even this factor.

The degree of economy that can be attained by electrostatic spraying to a large extent depends upon the shape and size of the articles to be finished. With small parts, ordinary spraying methods, as previously noted, frequently waste from 50 to 90 per cent of the material sprayed.

Less saving is effected on large, flat parts, and it is possible that in the spraying of metal sheets hand spraying would be more efficient. In the

FIG. 5—A laboratory study of the effects of detearing. At the left is a part which has been dipped in heavy enamel and allowed to dry without detearing. At the right is the same part after electrostatic detearing and baking.



finishing of all smaller parts, however, the electrostatic process will result in important economies, greatly increased speed, and distinctly improved quality of finish.

Typical of savings in high production finishing is a recent job involving about 200,000 small stamped parts, which previously cost $55 a thousand to paint. Sprayed electrostatically, the total cost of finishing has been cut to $23.

Electrostatic Detearing

In applying paint to any part or product, dipping has always been the speediest and most economical method, since it assures complete coverage and a minimum of wasted material. Its limitations are well known, and these have made impossible its use for certain jobs. Its most serious disadvantage, probably, has been the accumulation of excess paint tears at the drain-off points. These tears and fatty edges have seriously complicated the finishing process.

As an example, it has been necessary to bake the part at a temperature suitable for hardening the thickest sections of the coat. Unless this is done, the excessively heavy coat on the edges will be soft, tacky, and perhaps wrinkled. Frequently, tears have to be removed manually before the baking process is started, resulting in a high percentage of rejects and always requiring additional labor.

Electrostatic detearing is an automatic method of getting rid of excess material between the dipping and baking processes, and it results in a smoothly finished, clean-edged part after leaving the bake oven.

The work is carried by the conveyer over the drain board, and is allowed to drain to the point where the flow has ceased and tears have formed at the drain-off points. It is next passed over a grid to which an electric current of low amperage and a very high voltage (approximately 85,000 volts for most jobs) has been applied. This creates a strongly attractive electrostatic field between the part and the grid. This force is stronger at the lower points where draining naturally occurs. As the work passes through this field, the excess paint is drawn off in thin streams attracted to the grid, and a smooth, uniform coating results. The work can then be conveyed through the baking oven at a baking schedule suited to the entire coating.

Detearing electrostatically has made it possible to dip many parts that it was necessary formerly to spray at a much higher cost.

On many jobs, this has resulted in the difference between profit or loss, and, also, the difference between obtaining a job or losing it. An example of the latter occurred within the past 60 days.

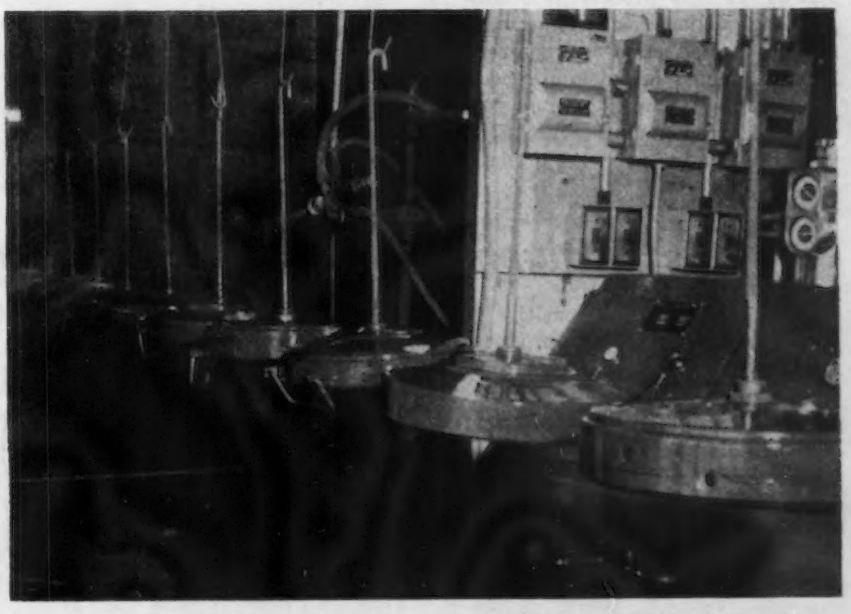
A manufacturer of component ammunition parts asked for a quotation on the job of supplying a bomb part that was to be finished ready for assembly.

The quoted price was $98 per 1000 pieces, and the Army Ordnance Department rejected the bid on the grounds that the price was prohibitive. An analysis of the price revealed the fact that a large part of it was represented in the cost of finishing the parts according to Government specifications. The cost estimate had been figured on the basis of spraying the parts, since dipping would not have provided the smoothness of finish required.

When the job was re-figured on the basis of dipping and electrostatic detearing, it was found that it was possible to supply the finished part to the required specifications at a price of $35 per 1000, a cost saving of more than 60 per cent. The Ordnance De-

FIG. 6—Mines of German design (manufactured for practice use of American forces) being loaded on to conveyer for electrostatic spraying.

FIG. 7—Here the mines are shown just as they leave the electrostatic field with their final coat of paint.



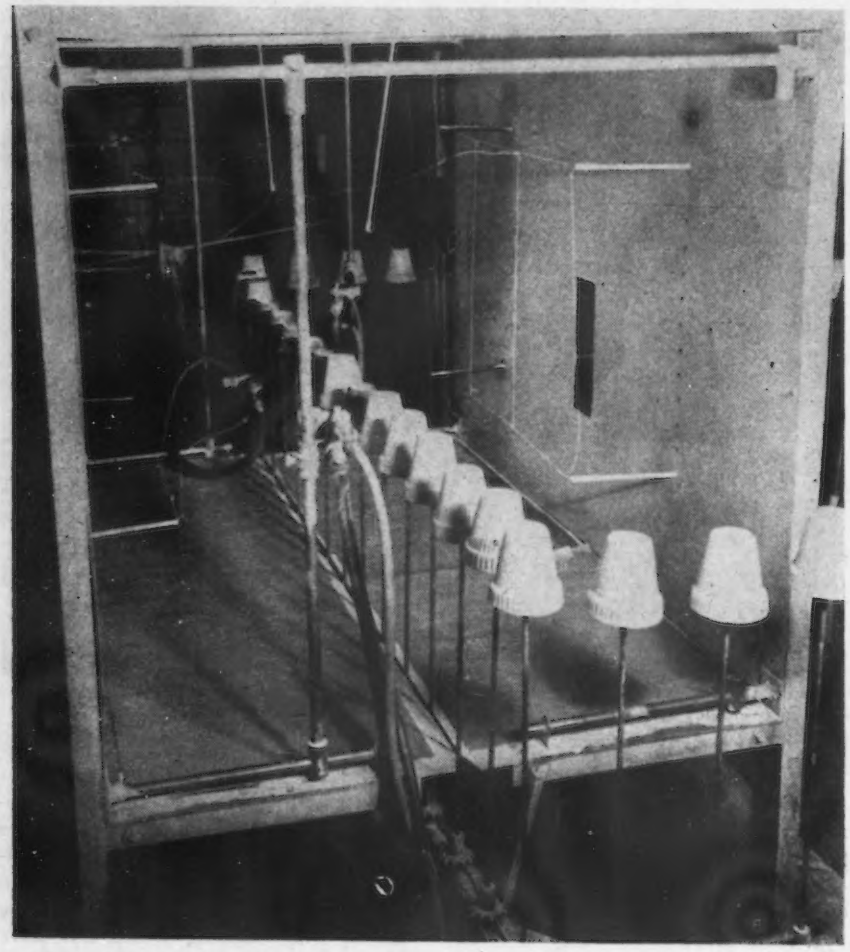


FIG. 8—An excellent example of cost reduction by electrostatic spraying. On this job, paint consumption was reduced to one-fifth that of hand spraying, and naturally the automatic set-up has eliminated much labor.

partment accepted the bid at this figure and the contract was let.

Many similar cases where equally large cost reductions have been made possible by the electrostatic detearing process might be cited.

Some of the special equipment required in this process is shown in the illustrations accompanying this article. Its effective use requires considerable industrial finishing experience and skill, since, for optimum results, certain factors must be carefuly controlled. For instance, the interval between the dipping operation and the application of the electric field must be exactly determined. The resulting variations depend on the size and shape of the parts, the flow characteristics of the coating material being used, and the evaporation rate of the solvents.

In electrostatic detearing, there are two limitations that it is well to note.

The first is obviously found when the coating material is sufficiently thermostatic to cause harmful flow during the bake, after the detearing has been effected. The second would restrict its use in the case of objects so formed that the drain-off radius was a comparatively large one. The process does not remove excess paint from such surfaces. But this can, in some cases, be corrected by hanging the part in such a way as to drain off the excess paint from a relatively small radius.

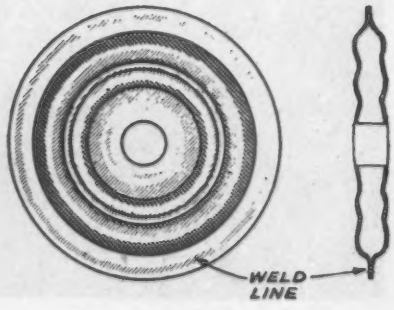
Electrostatic detearing and spraying are done in the same production line—in the same booths as a matter of fact—and the changeover from one to another is accomplished in a few minutes. The same electrical equipment is used for spraying and detearing, with only minor changes necessary. The function of the production line is as follows:

Parts are loaded by hand upon the large hooks of the 450-ft. overhead conveyer, sometimes five to a hook, as shown in Fig. 2. In the dipping process they are carried through a dip tank which is placed tandem to a booth containing the detearing grill, and after passing over a drain board they go through the electrostatic field and have all excess paint drawn off. Then they travel through an infra-red oven for their first bake, and after they have been air cooled sufficiently are carried through another dip tank, another detearing booth, and another infra-red oven, thus repeating the cycle and returning to a point near the loading tables, where they are unloaded, packed and sent directly to freight cars.

In the spraying process, the dip tanks are removed from beneath the conveyer and the parts pass directly into the booths and into the range of automatic spray guns which spray the parts as they enter the electrostatic field. In other words, the same finishing cycle is repeated under slightly different circumstances. The entire process is, of course, continuous, with conveyer speeds adjusted to suit the type of work being done.

Diaphrams Fabricated by Seam Welding

DIAPHRAMS for sensitive pressure gages are now produced by seam welding instead of the old method of crimping and soldering the edges, according to the Resistance Welder Manufacturers' Association, Philadelphia. Formerly made of beryllium-copper or phosphor-bronze, they are now manufactured of stainless steel and Monel, ranging from 0.006 to 0.008 in. in thickness.



As in many cases where resistance welding has been introduced, a reduction in manufacturing operations was effected. Where, before, two separate stampings had to be made allowing an extra flange on one stamping for crimping; now, two sections of the same stamping are seam welded together. This has produced a better diaphram at less cost than was heretofore possible.

Your Incentive Will Work

If Properly Planned

. . . A sound incentive program must be of mutual benefit to employees and employers. In order for such a program to be truly successful, it must insure high quality work, increased productivity and decreased unit cost while guaranteeing the employee increased earnings not subject to arbitrary reductions. How to achieve an incentive system that is solidly based on careful and accurate work standardization is herein described. This article is the last of a group of three on the subject of time study. The preceding articles appeared in THE IRON AGE of Aug. 17, pp. 60 to 64 and Sept. 28, pp. 40 to 45.

By DAVID ANDERSON
Industrial Engineer
and
ARTHUR H. HANSEN
Head of Standards Department
Bulova Watch Co., Woodside, N. Y.

THE last five years have seen a growing recognition of the value of incentive programs in increasing factory performance. Starting out originally as a means of inducing factory employees engaged directly in actual production to increase their output, modern incentives have been developed to cover virtually all industrial personnel up to and including the general factory manager.

While it is certainly true that incentive systems and programs have come a long way from the earliest simple plans which were based upon the offer of a flat reward to the employees who turned in the top performances, it is also lamentably true that a large number of incentive programs currently in use are admittedly unsuccessful.

There is no doubt that a properly thought out, well-planned and executed system of incentive payments for production above carefully set standards can be one of industry's most potent means of achieving significant increases in labor and overall plant productivity. Actually, there is no plant too small and certainly no plant too large to benefit greatly from the application of sound incentives. In general, an increase of 25 per cent to 50 per cent in productivity is a minimum goal of any effective incentive program, and there have been innumerable instances of plants in which productivity has increased by as much as 75 per cent above the level of ordinary day work production. But such increases in production are not cheaply bought. They require careful thinking and sound planning.

There are three basic requirements that every sound incentive plan must meet. All three are completely interrelated, and no incentive system can be expected to be successful for any length of time unless it meets all three. These are:

(1) It must result in an increased productivity of labor.
(2) It must result in a reduction of the unit cost of manufacture.
(3) It must result in an increased level of earnings for the participating group of employees.

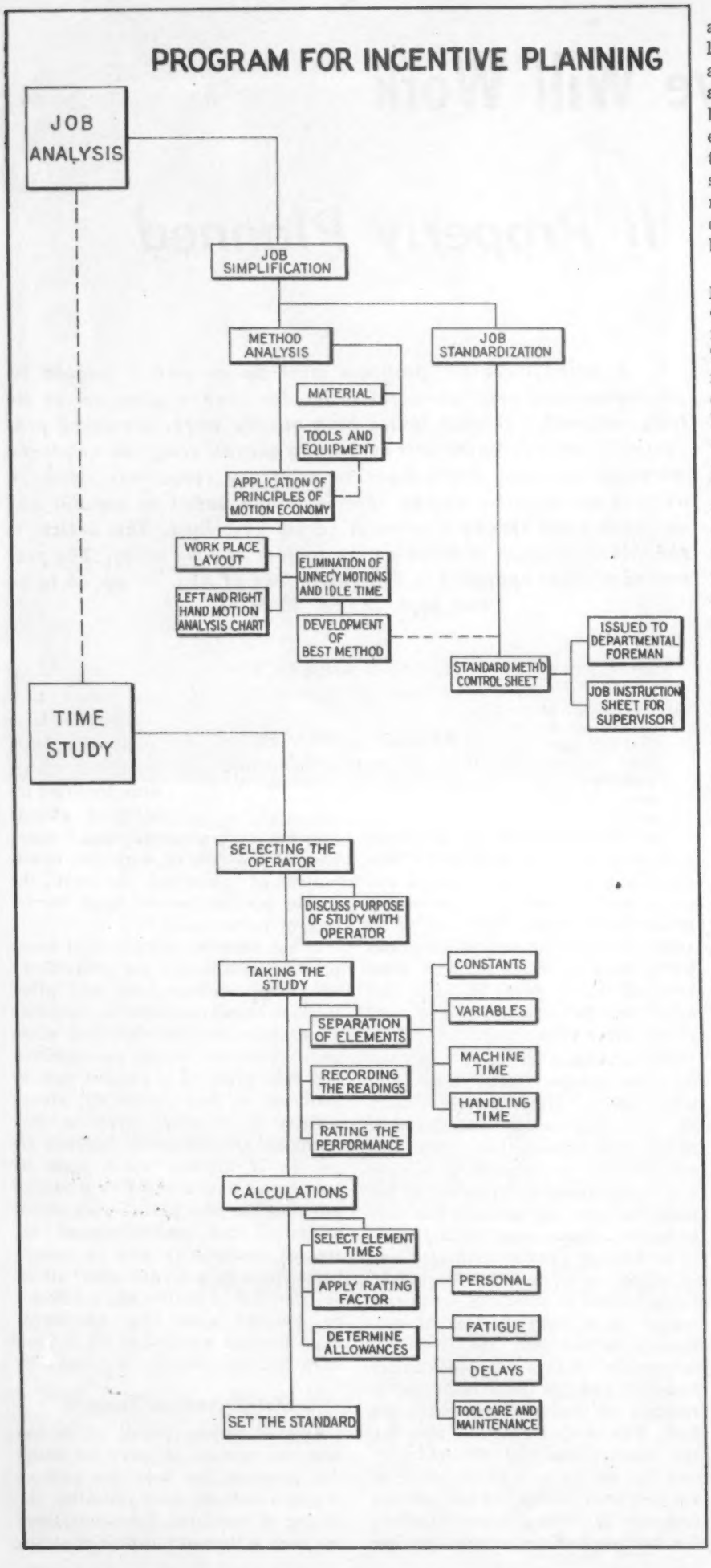
An incentive system is essentially a system of profit sharing. Unless there is a mutual advantage to employee and employer, an incentive program cannot work effectively. If an analysis were to be made of programs which have failed, there is no question but that it would be found that all of them failed to meet one or more of the above requirements.

The statement of these objectives is a far simpler matter than their achievement. Unfortunately, there has not been enough understanding of the close planning and careful calculation that is required to achieve a workable incentive program. In too many factories the tendency has been to base standards upon existing levels of performance, rather than upon any objective measurement. The usual characteristic of standards set in this manner is a complete lack of uniformity in the skill and effort requirements of the many jobs under standard, and the usual result is the creation of serious personnel problems. This method generally punishes the conscientious and efficient operator by setting a high standard on his task and rewards the less efficient operator by setting a low standard for his work. Even where this has not been done, and where time study has been used as a basis for setting standards, too often insufficient attention has been given to careful planning of the flow of work and distribution of personnel, so that the proper possibilities can exist for incentive performance.

It has been the experience of many plants that although the productivity of groups of employees may often increase under incentive, the unit cost of manufacture may rise. This often occurs when not enough consideration has been given to a planned flow of materials so that periods of intense activity at incentive levels of performance are frequently followed by periods of idleness which must be paid for at base rates. Unless proper attention has been paid to work standardization and quality control, increased productivity may be accompanied by a general, and often subtle, deterioration in quality which may not be detected until long afterwards when finished material is taken from stock for final assembly or disposition.

Motion Analyses Essential

Another serious pitfall which has been the nemesis of many an incentive program has been the absence of sound methods work preceding the setting of standards, for unless there has been a thorough motion analysis,



an examination of the work place layout, and of the tools being used and their condition, there can be no assurance that the standard is being based on the most economical and efficient performance of the task. In this event, even though a careful time study of the job, as performed, is made, there is still every likelihood of the establishment of a large number of unsatisfactory standards.

As soon as the standards have been put into effect, seemingly small but often very important changes may be made in the job layout and tooling. These will quickly result in numerous runaway rates with all of the consequent personnel and production problems they bring. Operators working on normal standards resent the high earnings of those on low standards. The same variations in the required work may take place on many jobs in the opposite direction, resulting in tight or high standards. If this occurs on even 15 or 20 per cent of the standards, complete chaos is the result. The standards cease to have any real relation to the actual skill and effort applied by employees to their tasks. The employee resentment and poor morale which can sweep the factory may make the incentive program completely worthless. If the management tries to correct high rates by reductions, employee reaction is often likely to be extremely undesirable.

Standards Affect Morale

Incentive systems are two-edged swords. A poor incentive program can easily result in much more harm to factory morale, and ultimately, to production, than any temporary good that it may accomplish. It has been the experience of the authors that no incentive is almost always better than a poor incentive.

The first requisite to be met in the creation of a sound incentive is the establishment of production standards with which to measure the performance of each employee or group of employees in terms of normal productivity. Before this can be done, however, there are several preliminary steps which must be taken.

The first requirement is standardization of work. Before any particular job can be measured, the work to be performed must be clearly identified. In addition, there must be some assurance that the task will remain unchanged as long as the standard is in effect. As soon as the job changes in any respect, a re-evaluation of the standard must take place. In order to achieve work standardization where it is absent, and to assure its continued maintenance where it is pres-

ent, an operation breakdown and analysis should be a part of every time study. Often the mere process of breaking a job down into its separate constant and variable elements will result in considerable work simplification. For example, an operation such as "inspect and repair" may often be divided into the two simple operations of "inspect and separate" and "repair." This serves not only the purpose of providing two operations which can be more easily measured, but will often result in a better utilization of the employee's skill, since it may be possible to assign the less skilled part of the work such as "inspect" to a less skilled operator and thus allow the more skilled operator working on "repair" to specialize and concentrate on that part of the work requiring his full ability. In addition, it may now be possible to set a stable time value on the operation "inspect and separate" and on the operation "repair". If a standard had been set on the combined operation, any change in the percentage of units that required repair would tend to invalidate the standard. If the percentage of units requiring repair were to increase, the standard would become too low; if it were to decrease, the standard would become too high.

Job Analysis

Work standardization and simplification go hand in hand; it is a basic requirement of good time study practice. The ability to see an operation both in terms of the whole and as the sum of any component parts is one of the things which distinguishes a time study engineer from merely a "rate setter". The gains very often derived from the job analysis which should take place as an integral part of all time study, especially time study for incentives, are very often great enough to more than pay for the cost of the entire incentive installation.

Work standardization and simplification include many things. All of them are basic to a smoothly functioning organization whether with or without incentives. The presence of an incentive system, however, serves to highlight and to emphasize the need for and the value of thorough job analysis. As a matter of fact many organizations use their incentive standards as a significant guide in determining the relative efficiency of their processing departments. Assuming that careful and competent time study has been used to set the production standards, the extent by which a department meets or exceeds the standards set, and therefore the

METHOD CONTROL

FORM FA 110

DESCRIPTION Load arbor, cut teeth, gauge and inspect OPER. NO.

DEPT. JOB CLASS DATE

PART NO.	MODEL	RATE	DATE	NOTES

LEFT HAND	RIGHT HAND
I	
Load Arbor while Machine is in Operation	
Idle	Pick up arbor chuck
Insert arbor in chuck and tighten chuck	Hold arbor chuck
Idle	Pick up wheel on arbor by stabbing with arbor. All wheels must face in same direction.
Push wheel all the way up the arbor.	Hold arbor chuck
Continue picking up wheels with arbor until 13 wheels are on arbor.	
Hold arbor chuck	Open arbor chuck
II	
Load and Unload Machine	
Idle	Unlock knob, pull carriage back when necessary.
Unlock arbor	Unlock bayonet
Remove finished arbor from machine, hold in palm, pick up new arbor from pre-position tray	Hold bayonet
Place loaded arbor in machine	Lock bayonet
Lock arbor	Idle
Turn knob up loosely	Push up clutch handle—very slowly
III	
Unload cut arbor, and inspect	
Hold arbor	Pick up locking pin, open arbor
Place arbor in a small potence	Idle
Hold arbor	Pull down handle to push arbor out of wheels
Pick up cut wheels and hold	Separate end wheel with heavy burr and discard
Hold cut wheels	Separate wheel from other end and put aside in small box
Drop balance of wheels in small metal box	Idle
Gauge one wheel out of each arbor.	

Equipment: - Mikron Gear Hobber
R. P. M. of Hob-400
Feed .008" per rev. of work
Gear Ratio 30:60

Misc: Ring gage & eye loop

OPER. NO.

ISSUED BY

FIG. 2—This type of motion analysis is valuable both for purposes of job standardization and for employee instruction on the job.

extent to which its employees earn incentive wages, is often an excellent barometer of the degree of overall efficiency. Many organizations have found their incentive system an effective and very valuable means of making comparisons between their several departments.

Quality Maintenance

The problems involved in a program of work standardization and its corrollary, work simplification, are twofold: Every job must be examined from both a qualitative and quantitative point of view. The task must be so set up that the nature of the work remains qualitatively the same. That is, the work to be done on each lot must be as nearly the same as possible. On a polishing operation, for example, the work to be done on each lot must be as nearly identical as possible to the other from the point of view of the amount of material to be removed, where this has a significant effect on the time required for the operation, and from the point of view of the handling, pre-positioning, and inspection required. Sometimes in order to achieve standardization, an examination of all the work done on the part up to the operation under consideration may be called for.

Variations in Short Cycle Work

Standardization is, of course, an important consideration on practically all types of work, but it should be remembered that it is of particular importance on short cycle work. On a job in which the cycle time for example is 0.10 min., a variation in the required time of as little as 0.02 min. will result in an increase in the overall time of 20 per cent and will, therefore, be accompanied by a decrease in the hourly output of 16.67 per cent. Conversely, a reduction of only 0.02 min. in the time required to complete the job will result in a decrease of the overall time of 20 per cent and, therefore, an increase in hourly production of 25 per cent. This is an important fact to bear in mind. On short cycle work, small changes in the job setup, resulting in what may often seem to the foreman insignificantly small changes in the time required for an operation, will often create extremely important changes in the total rate of production.

On precision work such as is done at Bulova, an examination of the "on the job" gaging and inspection requirements will often result in some very surprising increases in production. On a group of short cycle counterboring operations, for example, it was found that the operators were gaging and inspecting at the rate of about one piece out of every 15 to 25 pieces co-bored. Since the working time per piece was 0.08 min. and the time required for gaging and inspecting was 0.25 min., the gaging and inspection added at least 0.01 min. per piece to the cycle time of the operation. An examination of the operation revealed that actually a size adjustment on the machines was very seldom required more frequently than every 125 to 150 pieces. The job requirements were, therefore, changed to call for gaging and inspecting only one out of every 100 pieces. The gaging time of 0.25 min., prorated over 100 pieces was only 0.0025 min. per piece instead of 0.01 min. per piece. The co-bored pieces were dropped into a small box instead of into the large tote box. After every 100 pieces completed, the operator gaged and inspected one piece, and if that piece was satisfactory, the 100 pieces were dropped into the large tote box. Thus the quality control was maintained just as closely as before, and the overall output on the operation increased by about 10 per cent.

Uniform Earning Potential

In another instance, the earnings on incentive of a group of milling operations were very erratic. An examination of these operations revealed the fact that the diameter of a hole in the piece, which was used to locate the piece under the milling cutter was not sufficiently uniform from lot to lot to permit at all times easy positioning, and removal of the piece from the pilot pin. A change in the positioning fixture so that the piece is now located by means of pins which support the piece on its outside contour instead of by the hole, not only increased the output of this operation but resulted in an incentive rate with a much more uniform earning potential.

The second phase of job standardization, that is, quantitative standardization, is generally easier to attain, but it is just as important. If the actual earnings of an employee on incentive are always to reflect the skill and effort put into the job by the employee, the amount of work to be done, as well as the nature of the work, must be carefully controlled. For example, in a study of an operation calling for the staking of a flat spring into a slot, it was found that many of the springs frequently had a heavy burr on them which prevented their being positioned in the slot. In order to stake these springs, the operator had to put down his tweezer and deburr the spring by taking several strokes on a carborundum stone. A study revealed that when the operator was working on a lot where there were very few springs with burrs, his output was about 500 pieces an hr. When working on a lot where there was a substantial percentage of springs to be deburred, output dropped about 40 per cent, to 300 pieces an hr. Obviously no successful incentive rate could be placed on the work while it was in this condition. An examination revealed that these springs were all inspected for flatness and size before the staking. It was a simple matter to expand this inspection to include the separation of springs that required deburring. Stable incentive rates could now be set on the staking operation, and on the deburring operation. In addition, it was found by actual check, that the total output of the same operator now working on both operations was greater than his output on the single staking operation, which included deburring when necessary.

Every time study should include a careful consideration of all of the factors which might affect the time required for the operation, and every effort should be made to separate those factors which are constant for the operation from those which are variable. Of course, while complete standardization is the goal towards which the time study engineer strives, it is probable that for the most part, it can be completely achieved only on fully automatic work. The time study engineer must, therefore, make every effort to be sure that the performance which he is studying is being made under representative conditions. For example, in studying a deburring operation, he must be sure that the lot being studied is average with regard to the amount of burr. On drilling and hand milling, for example, the drill or cutting tool should neither be too dull through excessive use nor be freshly sharpened.

Overcoming Foreman Resistance

The second basic task which must be accomplished by the time study engineer before he can proceed with the actual establishment of a time standard for any given job is the completion of a method and motion analysis of the manner in which the work is being done. It is here that the time study engineer is likely to encounter the greatest resistance on the part of departmental foremen and direct supervision. For the time study engineer is now concerned with the manner in which the work is being performed. The general feeling on the part of

foremen and others in direct supervision is that through their years of direct contact with the work, they are in a far better position to determine the best manner of performing the work. Many foremen feel that methods work on the part of the time study engineer is a reflection on the foreman. Unfortunately, many time study men are themselves responsible for the prevailing attitude. Often, not enough time is spent with the foremen explaining the purpose and techniques of motion and method analysis. The experience of the authors, working with all lines of supervision, has been that once the foremen understand the approach of the time study engineer to the job setup, they will generally cooperate with him.

The method and motion analysis is extremely important in insuring the stability of incentive rates. Before a standard can be definitely established for any work, it is of paramount importance that every effort should be made to determine whether the work being studied is being economically and efficiently performed. This calls for:

(1) **An examination of the work place layout:** The work to be performed should be located within the normal working area. The normal working area is that area defined by two arcs made by both hands sweeping across the work table when the elbows are kept loosely at the side of the body. The maximum working area is the area defined by the two hands sweeping across the table when the arms are extended from the shoulder. The area of the most effective performance for both hands is directly in front of the operator in the area where the arcs of the normal working area overlap. All tools and parts to be picked up should be assigned definite locations within the normal or maximum work place area.

(2) **An examination of the tools and fixtures being used for the job:** All tools required for the operation should be examined to determine whether they are designed for the most effective use. Sometimes larger or smaller handles may be required for the most efficient utilization. Often it may be possible to suggest changes in the tool itself for a more economical performance of its task. Particular attention should be paid to the design of fixtures. From a motion economy point of view, it is often possible to effect considerable improvement in the job under study. For example, wherever possible, drop through delivery of finished work should be used. Very often, air ejection of finished work may be installed with a minimum of difficulty, particularly on drilling, co-boring and press work. Frequently, spring ejection from chucks and fixtures is easily achieved. Wherever the hands can be relieved for useful work, an examination should be made to determine the feasibility of the use of foot pedals. Through these and many other simple changes, which will often suggest themselves to the observant time study engineer, the job performance under study will frequently show amazing improvement. In one department of the Bulova plant, a simple survey to determine whether foot pedals were being utilized sufficiently, disclosed a surprising number of instances where, through the installation of foot pedals, production was increased by as much as 25 to 50 per cent.

(3) **A thorough motion analysis including a left and right hand motion analysis chart:** The final aspect of a job and job method analysis is the construction of a motion analysis chart similar to that shown in Fig. 2. Through an examination of the work performed by each hand in the accomplishment of a given task, it is often possible to achieve a better distribution of the work between the two hands. Frequently the motion analysis will show that the operation as being performed includes many needless and many incorrect movements. Many of the details of the job performance which might otherwise escape the attention of the time study engineer often become apparent through the use of a left- and right-hand motion analysis chart. It cannot be emphasized too much that very frequently, the smallest change in the operator method can exert a tremendous influence on the rate of production. Through a left- and right-hand motion analysis it may become apparent that the major portion of the work is being performed with only one hand while the other hand is idle or engaged in merely "holding" when it might be productively employed. Often if both hands cannot actively participate in the actual performance of a task, it may be possible for the idle hand to assist the working hand through the selection or prepositioning of material. Sometimes a better distribution of work between the hands may make it possible to attain a much higher degree of rhythm on the job. Through small improvements in the layout of the work, it is possible to reduce or eliminate many sharp changes in the direction of the hands, which tend to increase the visual attention required by the work and interfere with the acquisition of rhythm and automaticity. It should be stated here that, more often than not, these changes do not mean harder work upon the part of the operator. On the contrary, through better rhythm, bal-

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FIG. 3—Pivot polishing on high speed carboloy wheel to limits of 0.0002 in.

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FIG. 4 — Diamond polishing of jewel bearings the size of a pin.

anced movements and better symmetry, it is possible both to increase the output and lessen the fatigue and strain on the part of the operator. It is almost always easier on the operator if both hands are used wherever possible rather than having all the work done with one hand. The purpose of motion study is not to make the operator work harder, but to make the work easier.

Advantages of Written Reports

The written motion study also lends itself to another very important purpose for which it can be of great value. The motion study is the written record of how the job should be performed. It is the basis for operator instructions and training and a source of reference for work standardization. At Bulova, the motion study is used as much more than a record for the time study files. Every departmental foreman gets a copy of the motion study, and every new operator placed on a job refers to it as a job instruction sheet. Of course, the motion study is also a valuable record, providing the time study engineer with a complete record of exactly what has gone into every standard.

When the motion study has been completed, and a copy has been prepared for the processing department, the actual time study upon which the standard will be based may be made with complete confidence that every precaution has been taken for the creation of a standard that will be extremely stable. There can be no question, once the methods work has been completed, that the standard will be based upon a performance that is as economical and as efficient as practical. When standards are set through careful methods work, there need be no hesitation upon the part of management to guarantee the incentive rate against arbitrary reduction, for the extent to which the standards are exceeded by the employees becomes the measure of the employees' skill and effort.

Guaranteed standards are one of the greatest incentives that may be offered to employees to stimulate them to maximum productivity. One of the most formidable obstacles that incentive systems have had to overcome in industry as a whole has been the fear of employee groups that if the standards were exceeded by any substantial margin, the incentive rate would be reduced and the standard increased. If this fear is removed from the minds of employees, an important barrier to maximum production is removed.

Incentives on Predetermined Level

The primary purpose of incentives, from a management point of view, is to increase overall productivity. To attain this end, the incentive must offer opportunities for additional earnings to as large a portion of the participating group as possible. Each employee must understand that the amount of his incentive pay, as compared to that of any other employee, will be determined by the level of skill and effort which is brought to bear on the job. This means that the standards must be based upon the requirements of the individual operator who happens to be on the job. The standards cannot be based upon the output of either the slowest or the fastest operator. They must rather be based upon some predetermined level of performance which is to be expected from each employee before he can earn incentive pay. The amount of incentive pay must naturally be in proportion to the amount by which the predetermined level of performance is exceeded.

The process of determining this "normal" level of performance has been the subject of much discussion and theorizing. There are today sev-

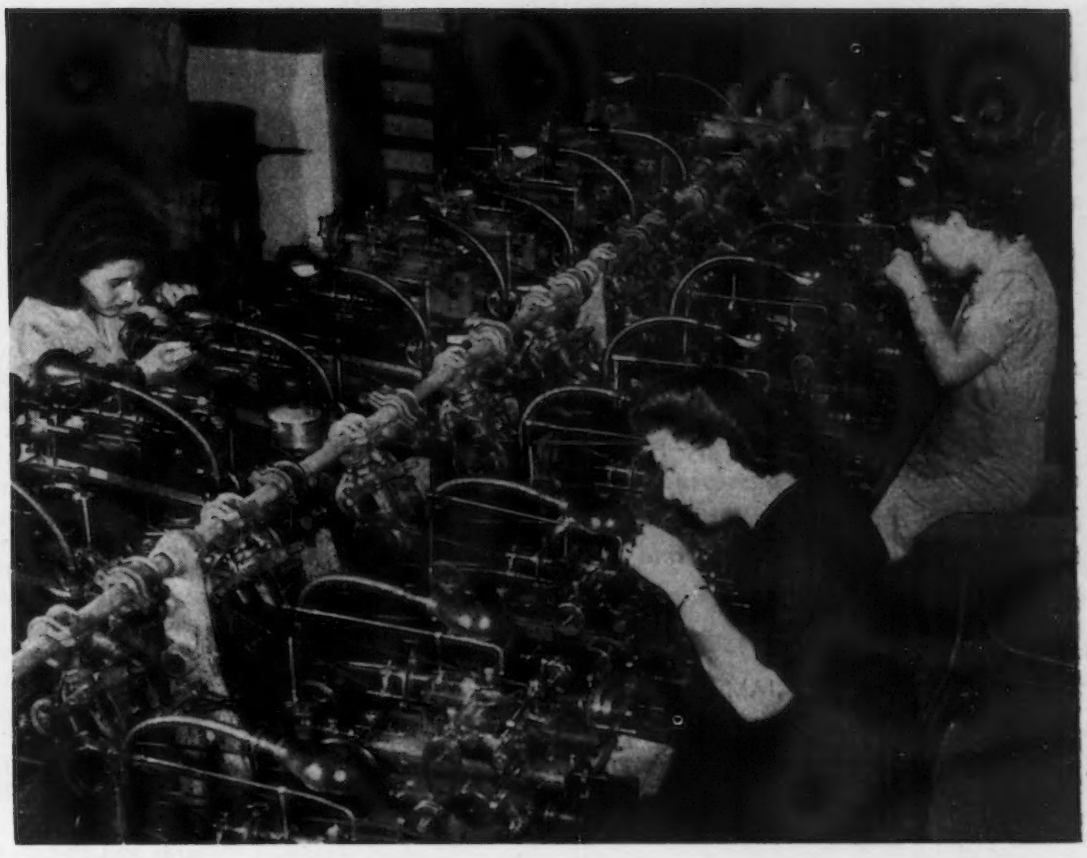

FIG. 5 — Batteries of leave cutting machines holding tolerances of 0.0005 in.

eral schools of thought, and several different methods are widely used in an effort to arrive objectively at a normal level of performance. Of course, the ideal answer would be to be able to select a normal operator for each study, to be certain of his complete cooperation, to be certain that he was neither increasing his normal rate of output nor holding back on his performance in an effort to "get a better rate" or possibly through nervousness. Once he had determined the most efficient and economical job method, the time study engineer could then make a time study of the performance of such an operator and simply base the standard upon his performance. For the most part, however, such a solution is not possible. The time study engineer must be able to set a satisfactory standard with the performance that is available. If the operator being studied is particularly skillful or conscientious, the time study engineer must be able to determine the exact amount by which his performance is yielding a higher rate of production than normal. Conversely, if the performance does not represent a normal amount of skill and effort, then the time study engineer must be able to determine the extent to which it is yielding less than satisfactory results. In either case, the time required by the operator being studied must be "leveled" to represent "normal" time.

One widely used leveling method*

**Lowry, Maynard and Stegemerten, "Time and Motion Study," McGraw Hill Book Co., New York.*

is based on the fact that any job performance is made up of four basic components. These components are skill, effort, conditions, and consistency. Under this method each of these components is divided into six levels of performance, each having a plus or minus numerical value. Each level of performance is denoted by the use of a descriptive word, such as poor, fair, average, good, excellent, or super-skill. For example, the leveling factor assigned to a performance rated as excellent in each category is determined as follows:

Category	Performance	Rating, Per Cent
Skill	Excellent	+8
Effort	Excellent	+8
Conditions	Excellent	+4
Consistency	Excellent	+3
	Total	23

The leveling factor, as determined on this basis, would be 23 per cent. The time required by an average operator would, therefore, be 23 per cent greater than the time required by an excellent operator. This method has been developed in great detail by Stegemerten. The chief advantages claimed for it are its simplicity and the fact that it minimizes the amount of training and judgment required for accurate leveling.

The authors have found, however, that this method, despite its popularity, is very unsatisfactory. The chief fallacy inherent in such a system of leveling is that it assumes that the relative importance of skill, effort and consistency in determining job output is always the same. On the basis of this assumption, fixed numerical values are assigned to each category and classification.

Actually, the relative weight of the contribution to total performance that is made by the factors of skill, effort and consistency is different for every type of job. On highly skilled jobs requiring a high degree of finger dexterity and accurate perception, the relative contribution of skill to effort may easily be in the ratio of five to one or more. On many other types of work basically requiring manual effort with a low degree of skill, the relative weights of skill and effort may easily be reversed.

For example, on such simple jobs as feeding large symmetrical pieces to a power press, excellent skill may contribute only a minor portion to effective performance. Excellent effort in feeding the work rapidly can easily

(CONTINUED ON PAGE 152)

Measuring and Designating Surface Finish

. . . The universal adoption of a convenient nomenclature for designating surface roughness based on microinch measurements together with replicas of standard surfaces, will further the mastery of surface quality control on the part of the engineer, the inspector and the machinist, now possessed of a unified language on the subject. In the first of this three-part article, the author discusses types of surface irregularities and standards of roughness values.

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SURFACE finish control directly affects industrial personnel all along the line. The engineer must know how to specify the surface finish most satisfactory for a specific application. The inspector must know how to judge the surface roughness of a part, how to accurately compare it with given standards and how to determine whether the part conforms to the drawing requirements. The machinist must know the range of finishes he can produce on a machine and how to produce them at will to conform to the roughness limits specified on a drawing. The coincidence of these factors falls within the objectives of a comprehensive system of surface designation.

The new system of designation described in this article clearly shows which surfaces are critical and which are not. It also permits the allowable roughness of these critical surfaces to be defined in microinch units (one microinch equals 0.000001 in.) and will provide an adequate means of controlling the surface quality of machined precision parts.

The true importance of proper surface quality control cannot easily be overemphasized. All machines, both large and small, owe their successful operation and length of life to the control of surface quality which, in most cases, is far more important than even the metallurgical, physical or dimensional properties for which adequate controls have already been established by industry. Wherever one part moves or rolls on another, wherever a seal must be established, wherever a packing or gland must slide, wherever an accurate dimension must be held or wherever wear must be reduced, surface quality must be controlled.

It is worth while to review what has been the common practice in designating surface finish. Referring to the geometric irregularities produced on the surface of a solid material by the cutting action of a tool, by abrasives or by other finishing devices, machine finishes were formerly indicated by the lower case letter *f* with a type number attached. Such designation, not being based upon a fundamental standard of measurement, was loose and unreliable. The symbols merely represented definitions which could be interpreted in several ways, and one man's opinion of the type surface finish intended could be ostensibly as well founded as that of another.

Consequently, designers found it necessary to add explanatory notes to their drawings, such as "rough grind," "lap," "smooth grind," etc., in an attempt to describe more closely the finish they wanted. By so doing, the engineer was specifying a method of manufacture rather than a true surface finish. But manufacturing variables often entered to influence the produced surface to be different from what was intended.

The attainments of a fully adequate type of surface finish designation has awaited the development of more precise methods of measuring surface finish and a universal agreement on simple and accurate definitions based on surface measurement results.

Toward this goal the American Standards Association, the Society of Automotive Engineers and the National Aircraft Standards Committee have set up tentative standards and proposed a suitable nomenclature for surface roughness designation. At the same time, these standards groups continue to enlarge their understanding of the basic factors involved in surface measurement and work towards the establishment of a universally acceptable classification of the various degrees of roughness and waviness of complex surfaces, and a universal set of symbols and numbers for use on drawings, specifications and reports.

Machine Markings

Measurement of the surface finish of a machined part considers only those irregularities which are a characteristic product of the machining used. Each type of tool or machining operation leaves its own typical markings. For example, a shaper with a round nose cutting tool can produce long, regularly spaced U-shaped furrows having sharp ridges; an end mill makes a curved pattern with half the curves extending in one direction and half in the other (Fig. 1).

Transverse markings (those across the direction of tool motion) are the result of the profile shape of the tool and the rate of feed. Longitudinal markings (those in the direction of tool motion) result from chip removal caused by irregular tool motion, changes in speed or condition of the tool, or variance in the quality of the material being worked.

Cutting conditions are different for various types of metals. In brittle materials such as cast iron, chilled castings and hard bronze, individual crystals torn away during the cutting procedure may form blunt, rough cavities that follow the crystal boundaries. In some cases, clam shaped cavities appear. When ductile materials such as copper, aluminum or mild steel are cut at low speeds, evenly spaced, wedge shaped crevices which widen toward the outer surface often appear. These crevices, also known as gaps, smear over or disappear when cutting speed is increased.

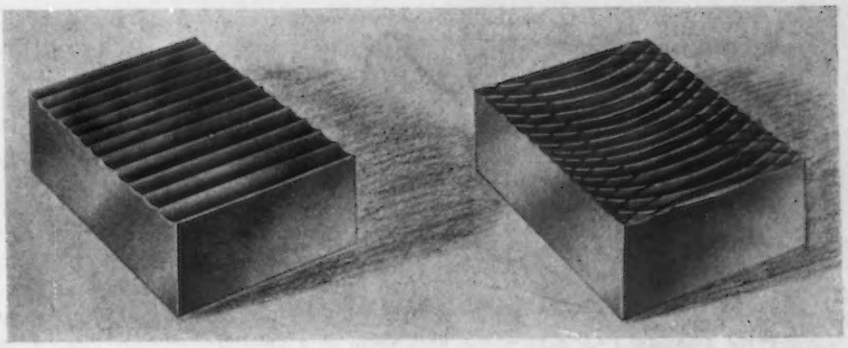

FIG. 1—Machining operation by a shaper leaves U-shaped furrows in specimen, at left. An end mill makes the characteristic curved pattern, at right.

Surface Terminology

Different finishing processes and machines will in many cases produce similar surface irregularities. Therefore, in making practical comparisons of surface roughness, particularly by the use of surface roughness standards, it is quite important that only surfaces having like geometric properties be compared with each other. Certain terms descriptive of the irregularities produced in machining operations may now be defined.

Flaws—The effect of flaws on the usefulness, suitability and value of a part are not considered at all in the microinch finish designation. Flaws are irregularities or imperfections which occur only at a few places in a piece of material; they are not typical of the surface as they are usually caused by factors other than the normal machining process. Scratches, dents and other local damage caused by surface contact with another part, tool or container, are classed as flaws; imperfections due to the presence of slag, checks, blow holes, inclusions, and scale also fall into this category. Acceptance or rejection of a part containing flaws is a matter of judgment on the part of the inspector.

Roughness is a recurrent irregularity typical of the surface. Roughness normally covers the surface so completely as to determine its appearance as well as its suitability for a particular purpose. Early definitions limited roughness to those irregularities having crest-to-crest measurements of 0.040 in. or less. This limit was included because the response characteristics of tracer point roughness measuring instruments, such as the Profilometer and Brush Analyzer, do not permit accurate readings beyond that value. However, for the purpose of this discussion, roughness shall be considered as referring to all those deviations from a nominal surface which are characteristic of the surface, regardless of the crest-to-crest distance of the irregularities. The nominal or mean surface is the hypothetical, geometrically perfect surface that would be attained if all the peaks or hills were leveled off so as to fill the valleys. The shape and location of the nominal surface is defined by the dimensions and tolerances of the drawing. An optical flat may be considered a close approach to the nominal or perfect surface.

Waviness is that deviation from a nominal surface which ordinarily takes the form of smoothly rounded waves. Waviness is an irregularity brought about by the deflection of the finishing machine or tool, by vibration or as the result of similar inaccuracies. Waviness, usually of greater magnitude than roughness, may be specified in inches as the maximum allowable peak-to-valley height, measured by a sensitive dial indicator having a 1/16 in. diameter ball contact. The waviness value in inches may be supplemented, when required, by a percentage bluing note (90—75—50 per cent preferred), which indicates that the surface shall show a certain per cent contact with a mating bluing gage.

Lay is the term used to refer to the direction of the predominate tool marks, grain, or pattern of the surface roughness. All surface roughness measurements or comparisons are normally taken across the lay, for it is this direction which gives the best comparative value, and the highest reading on tracer point analyzers. While a turned or ground surface has a very definite direction of lay, a lapped or Superfinished surface, on the other hand, has none, and hence, can be classed as multi-directional. Roughness measurements or comparisons may be made in any direction on multi-directional surfaces. The various directions of lay are illustrated in Fig. 2, together with lay designation symbols.

RMS Microinch Value

The many varied types of surfaces do not permit their definition by a simple number. However, a unit has been selected which, being based upon a definite unit of measurement, and which automatically takes into consideration the varia-

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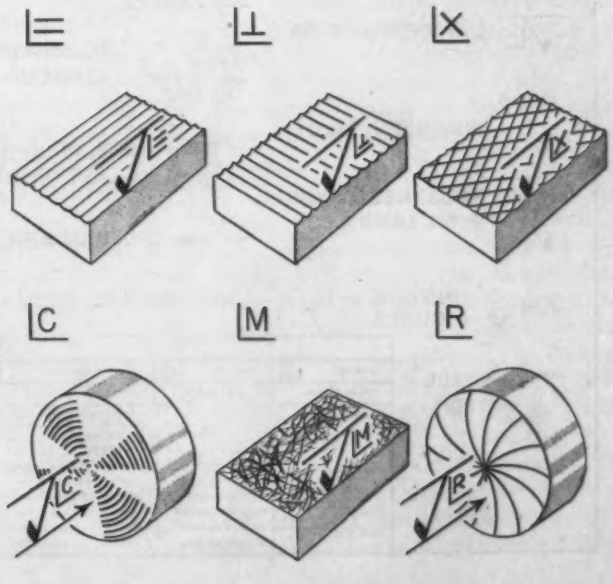

FIG. 2—Lay designation symbols and meanings. Top row (l. to r.)—parallel to the line of the surface indicated; perpendicular to the line of the surface indicated; angular in both directions. Bottom row—approximately circular relative to the center; multidirectional; approximately radial to the center of the surface indicated.

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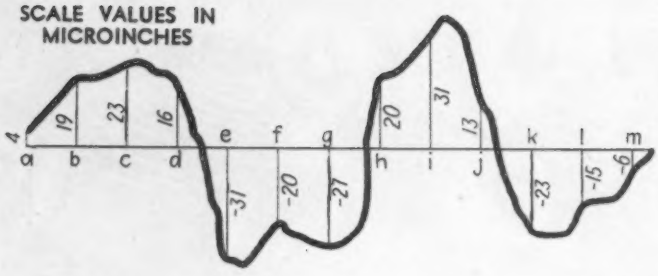

FIG. 3—Method for determining RMS value of a theoretically magnified surface contour.

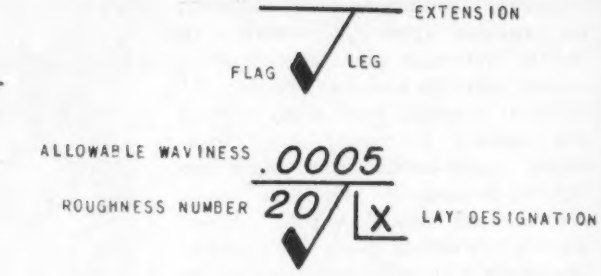

FIG. 4—RMS symbol used by North American Aviation, Inc. Manner of indicating surface values on symbol is shown at right.

tions in the surface geometry, serves as a satisfactory index of the degree or magnitude of the surface roughness. This is the RMS microinch value. It has been chosen by the standards associations and is now generally accepted. Today, when a number is assigned to designate the roughness of a surface, it is understood to mean the RMS microinch roughness value.

The RMS microinch value is defined as the Root Mean Square (square root of the mean square) of an infinite series of distances measured in microinches from the hypothetical nominal or mean surface line to the actual irregular surface contour. For all practical purposes, the RMS microinch value is a weighted average unit of surface roughness that is affected to a greater extent by the highest and lowest deviations from the nominal surface than it is by the minor variations.

The RMS microinch roughness value can best be explained by the use of a simple calculation. Assuming that the wavy line *A-B* in Fig. 3 represents a very short portion of the actual section contour of a machined surface greatly magnified, the RMS value is determined by first drawing the mean or nominal surface line for reference. This straight line is positioned parallel to the plane of the surface being measured, and at such a depth that the areas between it and the wavy surface contour line are equal above and below. The line represents the perfectly smooth surface that would result if all the material in the peaks were used to fill all the valleys. The mean line is then divided into a series of equal divisions; the more divisions taken, the more nearly perfect will be the result. From each of these points, *a*, *b*, *c*, etc., a measurement is made and tabulated. Each value measured is squared and the square root of the average or mean square (determined by adding the values and dividing them by the number of measurements taken) is the RMS value of roughness of the surface:

a	= 4	a^2	= 16
b	= 19	b^2	= 361
c	= 23	c^2	= 529
d	= 16	d^2	= 256
e	= 31	e^2	= 961
f	= 20	f^2	= 400
g	= 27	g^2	= 729
h	= 20	h^2	= 400
i	= 31	i^2	= 961
j	= 13	j^2	= 169
k	= 23	k^2	= 529
l	= 15	l^2	= 225
m	= 6	m^2	= 36
Totals	248		5572

Arithmetical average

$$= \frac{248}{13} = 19.1 \text{ microinch}$$

Root mean square average

$$= \sqrt{\frac{5572}{13}} = \sqrt{428.6}$$

= 20.7 RMS microinch

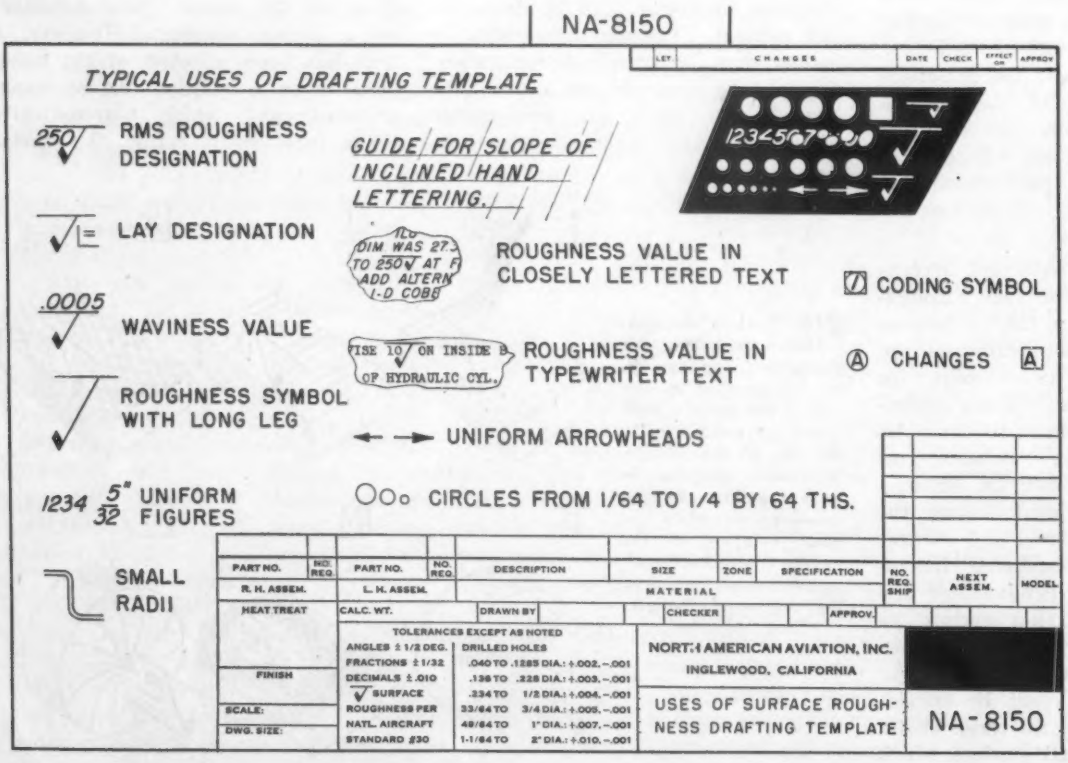

FIG. 5—Symbol template used by draftsmen at North American Aviation, Inc.

Comparison of the RMS value and the arithmetical average shows how closely these values correspond. Furthermore, as both take the same surface deviations into consideration, the arithmetical value would be just as suitable as the RMS value. Probably the reason the American Standards Associations tentatively selected the RMS average value was because of the belief that early tracer point surface analyzers indicated an RMS value.

A definite trend toward the adoption of the arithmetical average is now in progress. Whether the RMS value will stand, as measurement techniques are perfected, remains to be seen. In any case, both values are nearly the same and either usually lies within the accepted tolerances of measurement. However, since the standards associations have chosen the RMS value as their tentative standard, it has been used as the basis for roughness standardization through this discussion.

RMS Microinch Symbol

Various symbols derived from a check mark have been selected to indicate the RMS microinch roughness, and to permit the limiting roughness number to be specified without repetition of the words "RMS microinch maximum allowable roughness."

In changing from the use of "f" symbols to the new designation on all new drawings North American Aviation started by using the symbol proposed by the SAE in their Aeronautical Standard AS-107 and by the National Aircraft Standards Committee in the NAC-30. However, experience with this symbol brought out the fact that machinists tended to overlook it on the drawing. The symbol was new, and its meaning was not fully understood; above all, the symbol itself was not sufficiently conspicuous, particularly on poorly reproduced drawings. Therefore, North American added a flag to the basic symbol to make it more distinctive (Fig. 4).

This symbol has been adopted by the General Motors Corp. in its tentative standard for surface finish nomenclature. North American has subsequently devised a drafting template to assist the draftsmen in obtaining uniformity in the size and shape of the symbol; the uses of the template are illustrated in Fig. 5.

The roughness symbol is usually placed on a drawing as shown in Fig. 6. The number under the extension represents the maximum acceptable roughness; any smoother surface is acceptable. On plated surfaces, unless specific instructions to the contrary are given, the designated roughness is effective before plating. Areas of transition, such as chamfers, fillets, etc., conform to the roughness of the roughest adjacent area, unless otherwise indicated. When a roughness value is used, it may be closely associated with a dimension and should then be considered as effective for all surfaces defined by the dimension. Whenever surface roughness is critical, sufficient information should be given on the drawing to eliminate any possibility of misinterpretation. The Committee has set up the NAS-30 Standard Roughness Numbers for aircraft finishes, covering normal airframe manufacturing requirements. These standards, indicating RMS microinch maximum allowable roughness, are limited to the following preferred numbers (from very rough to extremely smooth):

500	40	5
250	20	2
100	10	1

Only nine preferred values are included in the NAS-30 Standard, whereas 12 are given by the A.S.A., and 25 by the S.A.E. The N.A.S.C.

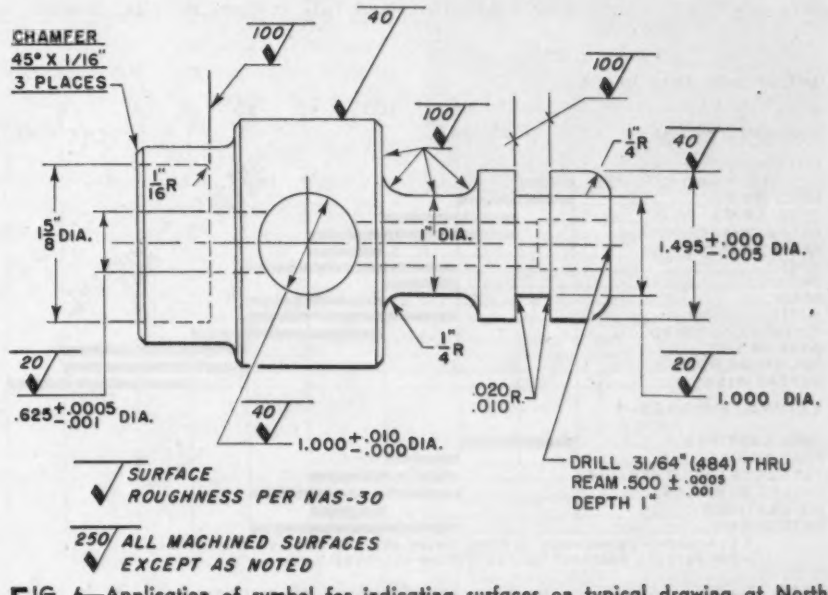

FIG. 6—Application of symbol for indicating surfaces on typical drawing at North American Aviation, Inc.

RMS microinch roughness number is always on the same side of the leg as the flag, and the designation for waviness and lay are located as shown.

Preferred Roughness Values

The various groups responsible for standardization have thus far not arrived at the acceptance of certain preferred roughness values.

The American Standards Association preferred numbers for indicating the RMS microinch roughness of surfaces are as follows: 1, 2, 4, 8, 16, 32, 63, 250, 1M(1000), 4M, 16M and 63M.

The British have adopted the arithmetical average in preference to the RMS average and have expressed a hope that we will also use it.

The Society of Automotive Engineers preferred numbers are as follows: *1*, 2, *3*, 4, *5*, 6, *8*, 10, *13*, 16, *20*, 25, *32*, 40, *50*, 60, *80*, 100, *130*, 160, *200*, 250, *320*, 400, *500;* the italic numbers are given first preference.

The National Aircraft Standards has limited its preferred surface roughness numbers in order to reduce the number of standard samples required for use in judging surface roughness by comparison.

North American Aviation uses the NAS-30 standards, and throughout the discussion and in the illustrations only these preferred numbers will be considered. However, North American's experience in the use of these numbers indicates that the gaps between 40 and 100, and between 100 and 250 might well be reduced.

A description of the various degrees of surface roughness considered standard by the NAS-30 follows, as well as additional data regarding the production of these surfaces and their application to aircraft parts. The chart, Fig. 7, may be referred to for nominal surface roughness to be expected of each type of machine finish.

The *500 microinch RMS surface* is a very rough, low-grade machine surface that results from heavy cuts and coarse feeds in milling, turning,

shaping, and boring as well as from very rough filing, rough disc grinding, and snagging.

This surface may be used on secondary parts which are not subject to vibration, fatigue, or stress concentration, and whose failure would not endanger the safety of the airplane. The 500 microinch RMS surface is seldom used for aircraft parts, but is quite suitable for clearance surface on jigs and fixtures.

The *250 microinch RMS surface* definitely shows tool marks resulting from a rapid feed in producing a medium machine finish. This surface may be produced by a very coarse surface grind, a rough file, a smooth disc grind, a coarse emery buff, and similar operations. Scratches caused by chips will not be cause for rejection, unless excessive in size and number.

This surface, by far the most popular for general use, is normally specified for all aircraft applications where stress requirements, appearance, and conditions of operation and design permit. It may be used as a rough finish for aluminum and other soft alloys, and as a surface for cut extrusions such as clips, braces, etc. It is used on steel and hard alloys where moderate notch sensitivity exists, but where a rough finish is otherwise tolerable. It is used for surfaces under moderate tension, and for the external portions of landing gear parts and hydraulic struts. The 250 microinch RMS surface may be used on interior parts where an average machine finish is acceptable, on structural parts having normal margins of safety that are not critical in fatigue, and on very deep bores that do not require a special finish for functional purposes.

The *100 microinch RMS surface* requires high grade machine work in which relatively high speeds and fine feeds are used in taking relatively light cuts with well sharpened cutters. All methods of direct machining will produce this surface under proper conditions, including coarse surface and cylindrical grinding, smooth disc grinding, and smooth hand filing.

This surface is suitable for use on main structural fittings and machined terminals subject to flight loads and vibration, such as wing and tail surface fittings, control fittings, control surface parts, etc. It may be used on highly stressed parts of the primary structure whose failure would endanger the airplane. It is the coarsest finish allowable for bearing surfaces, and may be used only where motion is slow and loads are light or infrequent. This surface is also used where close fits are required, such as for internal machined parts, and may be used for all stressed parts except rotating shafts, axles, and parts subject to severe vibration or extreme tension. The 100 microinch RMS surface is also adequate for short inside bores on highly stressed parts subject to vibration or flight loads, and for structural parts cut from extrusions or from sheet over ¼-inch thick.

The *40 microinch RMS surface* corresponds to a very fine machine finish, a carbide or diamond bore, a medium surface and cylindrical grind, a rough emery buff and a ream, burnish, or similar operation. This surface finish, in the case of turned parts, is usually obtained by removing fine tool marks by subsequent hand work with fine emery cloth or by power belt.

When specifying a surface of 40 microinch RMS or finer, careful consideration must be given to increased shop costs. This finish is used where stress concentration is high, or on external surfaces of cylindrical parts that are highly stressed by flight loads or subject to vibration. This surface finish, which is difficult to produce by lathe, mill, or other machining operation, but is relatively easy to produce by centerless, cylindrical or surface grinding, is very suitable for hardened steel and may be used for bearings where motion is not continuous and loads are light, providing the lay is in the direction of motion. If required, the 40 microinch RMS finish may be used on all stressed parts, except extreme tension members such as engine mount bolts.

The *20 microinch RMS surface* is produced by a fine cylindrical grind, very smooth ream, fine surface grind, smooth emery buff, coarse hone, or a coarse lap.

This finish is seldom used except where surface is of primary importance for proper functioning of the part. Typical applications are: rapidly rotating shaft bearings, heavily loaded bearings, and extreme tension members. It is the finish required for static sealing rings, bottoms of ring grooves, and similar applications.

The *10 microinch RMS surface* is produced by the finest cylindrical grinding, microhoning, honing, lapping, or buffing. It should be specified only where coarser finishes are definitely known to be inadequate; the interior honed surfaces of hydraulic cylinders are an example.

The appearance of surfaces of 10 RMS or finer is not a dependable way to judge their quality, as these finishes may either be bright or dull, depending upon the method used to produce them. Accurate comparison of fine finishes requires either "feel" or the use of roughness measuring instruments.

The *5 microinch RMS surface* is normally produced by honing, lapping, super-finishing, very fine buffing, or bright polishing. The 5 microinch RMS finish is required only where packings and rings must slide across the direction of the surface grain, such as a chrome plated piston rod where lubrication may be imperfect.

Next week, the second part of this article will dwell on methods of surface measurement.

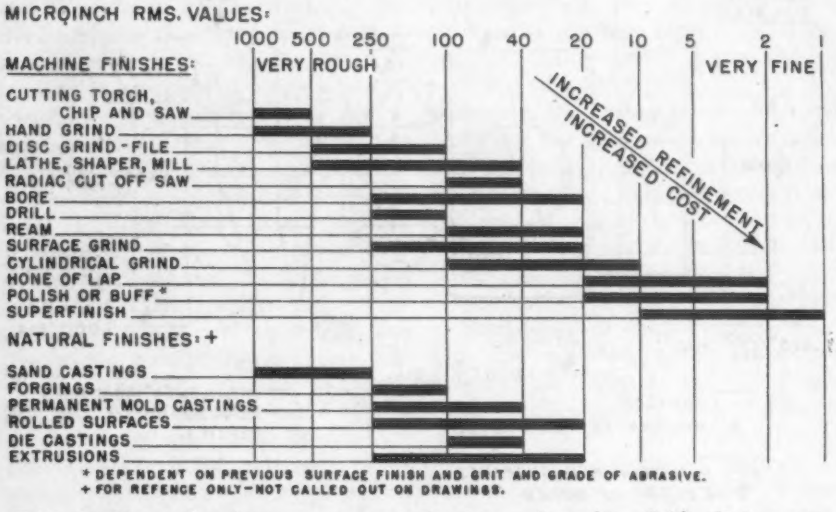

FIG. 7—Chart of surface measurements for types of machine finish. It is recommended that the engineer or machinist in selecting the machine finish required for a given application should give preference to values to the left in order to keep manufacturing costs to a minimum.

New Developments In Honing

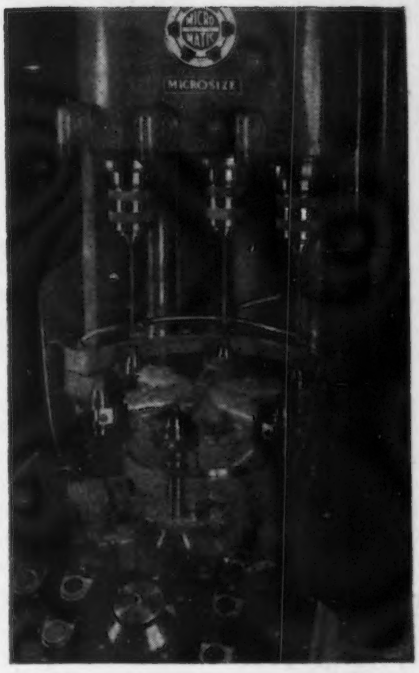

FIG. 1—In the honing setup shown here, diesel fuel injectors are rough honed, semi-rough honed and finish honed in progression. Each head is controlled by an individual gage which trips when desired dimension is reached.

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AUTOMATIC gaging of work in process, making production runs speedy and economical, and hogging out of heavier sections than were previously deemed practical are twin attributes of a new line of honing machines and sticks revealed this month by Micromatic Hone Corp., Detroit. Interestingly enough, these new machines qualify as the first entrants of the machine tool industry in the postwar sales race, and as such they are objects of highly interested attention from industrial purchasing agents, executives and master mechanics.

Two principles of gaging are embodied in the new Micromatic line, together with new means of fastening and impregnating the honing sticks. Together these make possible high speed multiple or progressive honing within size limits of 0.0003 in. on large sections such as cylinder barrels for heavy diesel engines, and even less on smaller parts. Costs are considerably reduced in the process, with savings of 50 per cent or more reported on a silver backed bearing used in Rolls-Royce aircraft engines. In fact, a subcontract for these pieces from Packard led to the development of the machines at Micromatic, where they are now being used solely for war production and will not be available for delivery until current WPB restrictions are relieved.

In developing these machines, particularly for the finishing of inner diameters in relation to outer diameters, Micromatic has evolved a new philosophy of processing. The generally accepted progression of operation has been first to produce a finished o.d. and then to machine a concentric i.d. from the previously achieved dimensions. In its work on Rolls-Royce components, however, Micromatic reversed this order, first rough honing the i.d., then mounting the work on an arbor and generating the o.d. concentric with the honed surface, and finally finish honing the i.d.

It is this line of approach which Micromatic engineers are urging on master mechanics and production engineers who are now working out

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FIG. 3—For large work, such as the cylinder barrel for diesel engine shown, Hydrosize control has been developed by Micromatic and installed on BarnesDril honing machines. In this setup, control of size is governed by drop in back pressure in the coolant line.

FIG. 2—The ring gage which controls sizing of the i.d. of these parts can be clearly seen in this closeup, in right foreground, immediately under the workpiece and hone. As the honing sticks enlarge the i.d., the plastic tabs at their ends trip the ring gage, which in turn withdraws the spindle.

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process engineering on parts for postwar automobiles and other products. In some cases there has been pointed out the possibility of utilizing a honing operation as the only machining necessary on precision forgings and castings after a preliminary operation, such as rough boring.

Automatic Gaging

Automatic gaging of small work on the new machines is accomplished by a feature named Microsize Control. In present applications to i.d. work, it consists basically of a ring gage mounted in the fixture immediately below or behind the work, Fig. 1.

Secondarily, the honing sticks themselves, rather than being cemented in a pressed steel channel, are now molded as inserts in plastic holders which snap into place against expander slots within the tool. These molded stone assemblies have a plastic tab projection at each end of the abrasive stick. The comparatively soft thermosetting plastic wears uniformly with the abrasive sticks and protrudes just beyond the end wall of the work at the bottom of the tool stroke.

As the i.d. is honed to size, the sticks and plastic in which they are embedded gradually reach the point where the protruding tabs of the plas-

[CONCLUDED ON PAGE 150]

Electric Furnace Operators Debate Production Problems

IN THE second annual conference on electric furnace steel, sponsored by the Electric Furnace Committee of the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers, held Oct. 5 and 6, at Pittsburgh, a record attendance of operators discussed the many mutual problems of furnace construction and maintenance, and various aspects of refining, deoxidizing, and pouring practice. Some of the data developed, particularly that dealing with refractories practice and the handling of chromium are set forth in considerable detail herein.

Factors Affecting Roof Life and Lining of Electric Furnaces

ONE subject of wide general interest accounted for a considerable proportion of the opening session Thursday morning, and that was the factors influencing the life of lining and roof.

The problem as regards roofs was pretty well summarized by Mathias Minen, of the Midland plant of Crucible Steel, who stated that the roof should be so constructed as to allow for expansion. There are some companies that build ribbed roofs to lessen the danger of a roof falling in. Crucible tried several ribbed roofs, but did not see any advantage over regular roofs. A new roof should be preheated before being placed on the furnace. High voltage and a long arc will tend to influence roof life.

The roof should be blown off after every heat. About 15 years ago tests on roof life were made. On several roofs the dust was not cleaned off. On another roof the dust was cleaned off every two days and on one roof it was cleaned off once a day. While on another roof the dust was cleaned off after each heat. The roof life did increase in proportion to the number of times cleaned. The roof that was cleaned off after each heat showed an increase in life of 35 per cent over the roofs that were not cleaned at all.

When duplexing there is less temperature variation than usual, which should give longer roof life.

When cold charging, roof life will vary with the type of charge and the type of charging equipment. Naturally on a machine charged furnace the roof will not be subject to as great a variation in temperature as that of a top-charged furnace. Here the roof is taken off the furnace and subjected to extreme temperature changes, which may cause the brick to spall and crack.

Some light scrap should always be charged on top of the crop ends so as to bury the arc when melting down, he further stated. And, the grade of steel to be made will influence the roof life since some grades require a higher temperature than others. A large roof span will decrease the life of the roof. The condition of the slag is one of the big factors in roof life. Any slag which allows the arc to be reflected directly to the roof is detrimental to roof life. This is especially true with a very strong carbide slag. The factor of distance between roof and bath has largely been overlooked during the last several years due to the need for electric furnace steel. Most furnaces have been over-charged, thus placing the bath closer to the roof. This will naturally shorten the roof life.

As regards small acid furnaces, the factors affecting roof life were covered by R. H. Frank, chief metallurgist of the Bonney-Floyd Co. He first pointed out that the roof ring should, of course, be the proper size and preferably slightly larger in diameter than the furnace shell, which will allow the skewbacks to fit farther back from the edge of the side walls. This will tend to prevent some spalling and will give better support after the side walls have started to erode. The condition of the ring with respect to the bottom flange, warpage and roundness should be considered and if very much out of line must be repaired. Maintenance of the bottom flange is especially recommended since it is the supporting member for the skewbacks. On the older type roof, that is, the ones cooled by a pipe, this flange can be easily cast in six to eight sections and new sections bolted into place whenever and wherever necessary. This method obviates the necessity of constructing a complete new flange and greatly minimizes repair costs. If the top course and seal are not properly cared for and allowed to erode badly the bottom flange will be exposed to the heat of the furnace and melt away rapidly. A bad ring condition is conducive to a poor fit of the roof bricks, since it may be necessary

to cut some of the shapes in order to complete the ring and in so doing, unless a refractory saw is used, they do not fit evenly.

As regards the permanent form for the construction of the roof, one method is to make it of wood and concrete with indexes so the electrode holes are in the proper position. A gage which fits into the center of the form establishes the inside diameter of the skewback ring. By using this gage a bricklayer can establish, within certain tolerances, an even ring of skewbacks and when this is accomplished, the remainder of the roof is easily made with the result that a considerable amount of poor fit up or slippage is eliminated. Extra time spent in the construction of the first ring is instrumental in prolonging the roof life and preventing shutdowns during the week. When the roof ring is slightly out of round or warped, compensation for this discrepancy can be accomplished by ramming ganister between the ring and the skewback.

The amount of expansion joints necessary for good life is a moot question. Recommendations run as high as 3/16 in. per ft. while practice varies from 3/16 in. to nothing. These joints are usually made with tar paper or thin strips of wood such as shingles. While Frank believes some expansion joints should be provided for in order to prevent crushing or spalling, no definite amount could be stated and it can vary within wide limits, depending upon the furnace practice, without materially affecting the life of the roof.

Spare roofs should be constructed far enough in advance so they will dry. Some operators and some brick manufacturers recommend that the roof be kept warm by using a small gas flame or by constructing an oven. This was tried but has been discontinued because no beneficial effects were noted and it was considered as nothing more than a waste of fuel. However, it is firmly believed that the spare roofs should be kept in a dry place.

Recommendations for electrode hole diameter seems to leave about ¾ in. to 1 in. clearance all around. This may be sufficient while the furnace is new but the wear on the masts and rollers causes a certain amount of play There is also an uneven expansion of the roof, probably due to the spacing and amount of expansion joints, whose direction cannot always be predicted Taking these two factors as a whole, this clearance is not sufficient. Outside of breaking electrodes, Frank mentioned that he had seen times when the pressure on the sides of the hole was sufficient to dislodge the brick. Since the distance was increased to a full 1½ in. all around with ½ in. on the cooling glands, this trouble has stopped.

The distance from the crown of the roof to the bath level is a deciding factor on roof life. Most operators will usually add several courses of side wall brick above the top of the shell in order to increase this distance and thereby decreasing the heat intensity upon the roof. The only objection to this method of increasing the height is that when the furnace is tilted for charging or tapping some of these brick may fall out. The best way is to lengthen the height of the side wall by bolting or welding on a ring of the proper height for the number of brick courses you wish to add. It might be well to suggest that the furnace designers study this height with the purpose of determining an optimum distance.

There are numerous causes affecting the roof life attributed directly to furnace practice, that is, after the charge has been melted. Using the high tap for prolonged periods on the molten charge with a thin or highly oxidizing slag in order to heat the bath, especially when using a deep bottom, or to melt scrap sticking to the side walls imposes a severe thermal condition, even to causing stringers. Excessive arc length and the practice where a violent carbon boil is induced, equivalent to the carbon flame of a converter, come under the same category. The practices where

lime, either burnt or stone, are used create an atmosphere in the furnace which acts as a flux to the silica brick. Fine ore thrown on the bath, no doubt acts in the same manner. Modern methods, especially where a large amount of hand shanking is done, necessitate the use of a high superheat to the metal in order to get good fluidity and consequently the refractories are near the melting point.

While the merits of the products from different manufacturers were omitted by Frank, he stated that under particular furnace conditions some bricks may give better life than others. Rammed sillimanite roofs on furnaces up to one ton have been used but their success seems to be dependent upon furnace practice. All the factors mentioned and possibly others all have some influence on the life span of the roof. This is especially true since on a normal 3-ton per hr. furnace, disregarding the tonnage produced, roof life may vary between 75 and 1200 heats.

The many factors affecting lining and roof life of small basic furnaces were considered by Floyd F. Dore, of American Steel Foundries, Verona. First mentioned was the method of charging. In their operation of a No. 5 Heroult furnace which is charged with chutes, a certain amount of own or return scrap is used in each charge, and due to its irregular size and shape it sometimes clogs in the charging door and consequently extends the time of charging so that the furnace cools and excessive spalling results.

Dore's plant uses 9-in. metal-encased brick for the lining and 9-in. silica blocks for the roofs. Expansion for the roof blocks is provided by using ⅛-in. cardboard spacers between the blocks. The linings run about 300 heats, and the roofs last about 250 heats.

Charging door arch jambs, roof rings and electrode openings are water cooled. Before using a water cooled charging door arch and jamb piece, only three weeks operation could be gotten before the brick arch would have to be replaced. The side door arch cannot be water cooled but the practice has been developed of using chrome magnesite brick for that arch, and it now runs the life of the lining.

Running on a schedule of 2 hr. 40 min., tap to tap, the best lining life is obtained. If the time is extended to 3 hr., tap to tap, additional time is allowed for the furnace to cool and more spalling results so that lining life is shortened by nearly 100 heats.

The heats usually are tapped at 3050 deg. F. Where this temperature has been increased to 3150 deg. F. to permit shank pouring the lining and roof life are shortened about one-third.

There is a vast difference in lining and roof life where the single slag heats are made as against double slag heats. Single slag heats are made much faster and the furnace is not held at temperature as long as with the double slag heats. It has been found that where additions of lime are made during the working of the heat less refractory life results than where the lime is charged along with the scrap.

It usually happens that the linings become thin rather uniformly throughout so that a brick patching job is not done. After a run of six or seven weeks, relining is done from the slag line up. Several schemes of applying refractory patching material to the lining have been tried but so far they have not been able to do a job that is worth the effort. No patching repairs are made to our roofs. They are replaced when they become too thin. Refractories for linings cost about 18c. per ton of charge; roofs about 4c. per ton of charge.

In further discussion of roof life by the various operators present, it was pointed out by S. D. Gladding, of Bethlehem, that because of space limitations in a recently constructed furnace department they were influenced to discard silica roofs in favor of Sillimanite roofs. These were installed on 50-ton units. An average of 133 heats per roof was obtained, which was three times the life of silica roofs. Furthermore, the sillimanite roofs tended to sag four or five heats prior to collapse, as against the quick collapse of silica roofs without warning.

A crucible operator reported that through an error a roof with 20-in. electrode openings was put on a furnace carrying 18-in. electrodes. Whereas a drop in roof life was expected because of greater flame erosion, it was actually found that 12 per cent longer life was obtained with the larger opening around the electrodes. Other operators tended to agree that larger openings were apparently preferable.

Considerable discussion developed regarding apparent longer life of silica brick impregnated with water or tar. Whereas the refractory representatives tended to minimize the benefits of such impregnations, it was concluded that where the brick were subjected to sudden heat shocks, as for instance when they are placed in the furnace for patches, the volatization of the water or tar would tend to slow the thermal shock and thus reduce spalling. It was also demonstrated that poor preheating of roofs could actually be more injurious than no preheating. For, in the latter instance the roof would at least be subjected to uniform temperature when placed on the hot furnace.

Dr. Briggs then continued the discussion by reporting that at the Indiana Harbor plant of American Steel Foundries, roof life for top-charge acid practice is as high as 900 heats. The steel is tapped at 3200 deg., and power consumption is 460 kw-hr. per ton charge. Distance between bath and roof is 3½ ft., and dust is blown off the roof every 24 hr. General Refractories standard shapes are used in a notched roof. Melt-down takes about 1 hr. The 220-volt transformer tap is used to start melting down, after which the 190 tap is used, then the 160, and finishing is carried out on the 144 tap.

An interesting communication on roof life by E. G. Jones of Isaacson Iron Works, Seattle, was then read to the operators by H. W. McQuaid, of Republic Steel Corp. Jones stated that they probably use more expansion allowance than the brick manufacturers recommend but this is the amount found to give best results. They have very little, if any, spalling.

The roofs are preheated for about 60 hr. before putting them into service. An electric heater, automatically controlled, slowly brings the temperature of the roof up to 1000 deg. F. Spare roofs are fully equipped with electrode cooling glands and a roof change has been made in 43 min., 50 min. being about average.

Roofs are, of course, changed between heats. The furnace is charged and power put on until the electrodes are well down in the scrap. This helps in two ways: (1) It lowers the heated electrodes down far enough so that the men can climb on to the roof and attach the swivel pin and remove the electrodes rapidly without being exposed to too much heat; (2) having already bored fairly deep into the charge the new roof will not be exposed to the arc to any great extent until it has soaked up considerable temperature and can resist expansion stresses. The old roof is removed with one crane and the new one is set in place by another and therefore the preheated new roof is not exposed

long enough to the air to start spalling.

During the first heat on the new roof melt-down is carried out rather slowly and the high tap is not used at all. After the first heat on a new roof has been tapped all of the accumulated dust is blown off and a thin mixture of silmanite cement is poured over the roof and swept into the brick joints. This gives a tight roof and prevents furnace gases from working up through opening joints and burning the brick. The dust is blown off the roof at the end of each shift. This seems to allow the heat to radiate through brick in a normal manner and prevents a build up of temperature on the inner face of the roof. This is of course contrary to any arguments for insulated roofs.

With a top-charge furnace the operators if not watched will raise the roof about 8 in. after tapping the heat in order to allow the smoke and gas to escape from the furnace more rapidly so that they can see to patch the bottom or banks. If they are allowed to do this they may save a minute or two in patching, but doing so causes a cold draft of air to be pulled off the floor right up on the face of the roof and it is possible to observe considerable roof life spalled away with just one treatment of this type. The roof should not be moved up or off the furnace until the charge is ready to place in the furnace, but if more than one charge is necessary the roof is swung back into place while the second charge is being picked up.

The high voltage tap is not used on the transformer, which is 267 volts, but this has been cut down to 235 volts. This has had a lot to do with high refractory life and as a matter of fact has resulted in faster melt-down. The scrap does not weld together around the banks and falls in more rapidly than when we use the high voltage. Perhaps this would only be true with the type of scrap used although 30 per cent heavy turnings are melting. The furnace is started out on a low 140-volt tap for 7 min. which buries the electrodes sufficiently to prevent the arc from splashing on to the roof and carrying iron oxide into the brick face. After 7 min. the furnace is switched over to the high tap and melt-down is carried out on this tap until only a small amount of scrap remains on the banks. This scrap is pulled in and melting is finished at 220 volts.

What it costs to preheat a roof electrically is not known, as the heater is metered with the melting furnaces. However, total consumption is only 480 kw-hr. per ton melted.

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Construction Methods for Side Walls And Bottoms of Basic Furnaces

SIDE wall and bottom practice on 35 and 70-ton furnaces was described by E. J. Chelius, of the Duquesne works of Carnegie-Illinois. He stated that the initial two courses on the furnace bottom are, first-quality fire brick, laid dip joint with fire clay in opposite direction to break joints. The brick is 9 x 4½ x 3 in. straights. The next two courses on top of the fire brick are hard burned magnesite, laid in the opposite direction with an allowance of ¼ in. per ft. for expansion. The brick is 13½ x 6 x 3 in.; the magnesite is not bonded to the fire brick. Next is laid one course of chrome brick 2½ in. flat, making a total thickness of the bottom of 14½ in.

From here on up to four courses above the sill plate, hard burned magnesite is used, allowing ¼ in. per ft. for expansion. One, 13½ x 6 x 3 in., and one 9 x 4½ x 3 in.; wall thickness 18 in. At this point in the wall, four courses of Steel Klad Ritex magnesite are laid, then one course of hard burned magnesite alternating to top of shell.

At the tap hole 10 ft. on an arc in line with the sill plate, up 12 courses, to 2 ft. 6 in. on the arc, the lining is hard burned magnesite. This portion of the furnace is laid with fire clay to seal joints. Also in this section, between the 4 in. jacket or shell lining and the 13½ in. inner lining, there are placed thin sheets of stainless steel scrap. This has been found to be helpful in tear downs. It prevents steel seeping through joints of the brick and adhering to the shell of the furnace.

Chelius reported that they started the use of Gun Mix on a 35-ton furnace that had 140 heats on the lining. The furnace shell showed color in two spots on the back wall, 20 in. down from the roof and to the right of the spout, 12 in. above the metal line. Under normal conditions the furnace would have gone down for reline. The three spots were shot and in the next 25 days eight repairs were made using 14,900 lb. of Gun Mix.

The time consumed for shooting was 12 hr. and 13 min., extending the life of lining to 203 heats. Prolonged life was 63 heats, of the 203 heats made; 118 of the heats were Stainless, 85 were SAE, making a total of 203.

The 75-ton furnace had 88 heats on the lining prior to using the Gun Mix, and the lining was getting thin. Its life was extended to 141 heats by using 8000 lb. of Gun Mix. Time consumed for shooting was 7 hr. and 50 min. Prolonged life was approximately 40 heats.

Basic bottom and sidewall construction was then dealt with by Charles F. Staley, of Armco. He stated that on the construction of a new bottom, where the bottom has been removed to the shell of the furnace, 1½ in. of fast drying insulating cement is first added on the furnace bottom. Next, a thermo-flake block that measures 13½ in. high by 2½ in. thick is stood around the shell of the furnace to absorb the expansion of the magnesite brick. On top of the insulating cement is next placed a flat course of high grade clay brick. On top of the clay brick three courses of magnesite brick are laid in the following manner: First course, running east and west; second course, north and south; third course, running east and west. The reason for this is to insure that none of the joints of the brick fall directly over the top of one another where, in case of a hole, steel might seep between the joints of the brick and some day cause the bottom to go through.

The sides of the bottom are next started. High grade clay brick is used next to the thermo-flake block and is carried up the side walls approximately 13 in. Magnesite brick is next laid on the top of the clay brick and brought up in steps to a 13½ in. wall. The exact number of steps is five. In laying the magnesite brick on the sides of the bottom a thickness at all times of 13½ in. is maintained. This 13½ in. wall is carried up the sides to one course above the sill plate where the side walls start. No expansion or wet mortar is used in the bottom at all. On each course of the magnesite brick laid, fine dry chrome ore is dusted and swept into the joints of the brick. This insures a tight seal.

After the brick work and before the bottom material is added, 1 qt. of so-

dium silicate to 1 gal. of water is applied with a broom to the brick surface. The bottom material is next added in quantities up to about 500 lb. This material is rammed as tight as possible using an air gun with about a 6-in. stroke. Before each addition of the bottom material is added, the previous or rammed portion is roughened up with the point of a shovel. About 6 in. of bottom material is added, thoroughly rammed. This is burned in for 12 hr. One hour before the power is taken off, 200 lb. of open hearth slag is added all over the bottom.

Brick count for bottoms:

Clay Brick:	560	No. 1 Keys 9 in.
	350	No. 2 Keys 9 in.
	200	Straight 9 in.
Magnesite:	550	No. 1 Keys 9 in.
	1200	No. 2 Keys 9 in.
	450	Straight 9 in.

The bottom is torn out at the end of a 1000-heat campaign, or before if needed.

For sidewalls, a straight wall is made up of No. 1 Key brick and No. 2 Key brick. In the jambs of the furnace there is used a special jamb block. On each bed joint and each cross joint a sheet of 16-gage metal is used to take care of the expansion. The strip used in the cross joint is corrugated, while the strips used on the bed joints are flat. These sheets are made out of mild carbon steel. The arches of the furnaces are built with a 1½ in. rise per ft. The arches are laid up with chrome patch as mortar.

On a sidewall rebuild, a water cooled platform that fits about 6 in. below the slag line is used from which the brick masons work. This platform is placed inside the furnace as soon as the sidewalls become black after the roof has been removed. The brick from the old sidewalls are then knocked out onto the platform and the brick raked out into a box. The rebuild time has been reduced with this platform from tap to power-on about 6 hr. Complete time for brick layers is about 5 hr.

The total brick count being:

No. 1 Keys	540
No. 2 Keys	450
No. 1 Arch	74
No. 2 Arch 9 in.	48
Jamb	36
Straight	68
Featheredge	18
Neck Brick	18
Chrome Patch	600 lb.

On the maintenance of the basic sidewalls, a Gunmix gun is used. The only time this gun is used is when there is a thin spot in the furnace, or just before a roof is changed. This gun has been used for only a couple of months, but it looks as if it will save quite a bit of money in increasing the furnace life. Average furnace life is around 200 to 250 heats.

Continuing the discussion of basic bottoms, H. C. Bigge, of Bethlehem, pointed out that above the slag line the walls may be built of silica brick, metal encased magnesite brick or magnesite brick with a thin layer of metal between each row of the brick. The latter is a recent development which has shown excellent results with number of heats varying from 100 to 400 heats reported or five times that of silica brick. Wall thickness ranges from 13½ in. in small furnaces (11-ft. shell diameter) to 18 in. on 20-ft. shell diameter on the larger furnaces. At the bottom of the sidewalls, a clearance of about ¼ in. per ft. is usually allowed for magnesite brick, and near the metal line ⅛ in. per ft. between each brick. Not less than 3/16 in. per ft. should be allowed for silica brick. The brick in either case are laid dry.

Refractory service is particularly severe around the charging door entrance and water cooling is widely used in such spots. Rammed bottoms of a high MgO content have proved to be more efficient than burned in bottoms if properly installed. With a rammed bottom, a hearth high in MgO content is obtained without silica (SiO_2) infiltration from the overheated walls and roof which might occur during the sintering or burning in process. The material purchased for rammed bottoms is shipped in 100-lb. bags as dry clinker, comprising a mixture of fine and coarse particles. It is mixed on the job with water only, to a consistency of damp molding sand. The usual amount of water needed is ¾ gal. (6 lb.) to 100 lb. of the mixture. Too much water must be avoided; a soupy mixture will not dry thoroughly, but forms a spongy mass that will not ram into a hard bottom or patch, the only remedy for which is the removal and substitution of drier material.

On the other hand, too dry a mixture cannot be rammed to the desirable maximum density and strength. The amount of mixture to be mixed at one time depends on the speed of ramming. It rams very easily, as it does not creep under the hammer. It is possible to ram upwards of 1000 lb. per hr. per rammer. Do not permit the mixture to stand for more than 15 min. before ramming.

The most satisfactory rammer is a molder's air hammer with 6 to 7-in. stroke and 3-in. head operated at 80 to 100 lb. air pressure.

To eliminate bottom patching delays it is necessary that new bottoms be properly installed. The most satisfactory basic bottom is one in which the sub-hearth is built to the desired contour with magnesite brick, over which is a rammed high magnesia refractory to a depth of 5 to 9 in. is installed. As much as 50 per cent in time is saved by this method over the practice of burning in. If the brick work is set up and sealed in such a manner that crevices are avoided, the whole bottom becomes a monolith through which metal or slag rarely penetrates deep enough to cause damage, thus causing less servicing after the tap.

Door arches and jambs must be so designed that the brickwork is not damaged in charging. During periods of continuous operation, magnesite linings are justified in the basic furnace. However, magnesite arches and jambs have poor structural strength and are a source of delay between heats because of necessary repairs. Much of this may be avoided by installing water-cooled arches directly back of the door frame to supplant one course of brickwork. This arrangement supports the whole arch and jamb and is very efficient when serviced adequately.

Increasing the size of door openings permits the use of larger charge boxes and will speed up charging from 15 to 20 per cent. This is important to the larger furnaces.

Bottoms of the above type have been used for making a total of 3000 to 4500 heats equivalent to 250,000 net tons of ingots making double slag heats of SAE and stainless compositions.

Maintenance — Materials used for patching consist of clinkered dolomite requiring 20 to 40 lb. of material per net ton of ingots which is added after the furnace has been tilted, thoroughly dried with an air blast.

Chinkered Dolomite—The sizing of double burned dolomite is a question which should be established by specifications. No one grain sizing is preferred by the various electric furnace operators on account of the strong

preferences at different shops for different grain sizes. In general, a small grain size is preferred for maintaining smaller furnaces and large grain size is preferred for the larger furnaces.

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Chromium Loss and Recovery, And Control of Residual Chromium

IN discussing chromium loss and recovery, one operator pointed out that since chromium is nearly as susceptible to oxidation as manganese, the loss of chromium from the charge during melting and the recovery of chromium from ferroalloy additions is a real problem in the manufacture of steel in a basic electric arc furnace. Aside from the economics involved, the recovery of chromium is especially important in these times because of the scarcity of the alloy brought on by wartime conditions.

The oxidation of chromium from the charge has a particularly deleterious effect on the physical condition of the slag. Due to the refractory nature of the Cr_2O_3 formed by the oxidation of chromium, loss of chromium from the charge results in a viscous, gummy slag which is hard to work. Under such a slag the carbon reaction is very sluggish and the bath remains quiet, partly because the transfer of oxygen from the atmosphere to the metal bath is very slow and partly because none of the ore additions is trapped in the slag and never reach the metal.

It is generally believed that at the higher chromium contents the rate of the chromium loss is higher. To substantiate this assumption, a number of heats from a 7-ton basic arc furnace were chosen for study. The drop in chromium from charge to melt was plotted against the carbon drop from charge to melt for charges of varying chromium contents. The diagram showed that the higher the chromium content of the charge, the greater the drop in chromium for a given carbon drop. It appears that above approximately 1.5 per cent chromium the drop in chromium remains about the same for a given carbon drop.

Since in the furnace in question the charge usually melts in about 2 hr., the diagram may also be looked on as a means of measuring the rate of chromium drop for various chromium charges.

Regarding chromium recovery for chromium additions made in a single slag process or during the reducing period of a double slag process, heats were chosen from the same 7-ton furnace. The figures indicated the following approximate recoveries for various chromium charges:

0.50 to 1.25 Cr ...	100 per cent
5.00 Cr	95 per cent
12.00 Cr	92 to 94 per cent
18.00 Cr	90 to 92 per cent

E. J. Chelius, of Carnegie-Illinois, continued with a discussion of the control of residual chromium. He said that at Duquesne they are not troubled too much in melting heats high in residual chrome. Scrap segregation, closely controlled in our ordinary and rimmed grades (from their own open hearth), materially helps this picture. Although a good portion of production is stainless, their product mix by selection of heats, permits gradually working down the chromium.

Their practice, when confronted with high chrome melts, is to oxidize bath with lump vermillion ore, heating furnace cinder or lancing with dri-ox. A sample is taken for residual chrome and if below desired limits, the heat is slagged-off clean, taking special care to completely remove all of the oxidizing slag, to eliminate the hazard of chromium reversion.

Normal procedure on high residual chrome melts is to divert to a high chrome order, if available.

The opening up of heats melting high in chromium and meeting low-chromium specifications was next covered by Mathias Minen of Crucible. Stating that it is known that each individual heat is a separate problem and must be dealt with accordingly, he said that the reaction is dependent upon the chemical composition of both slag and the bath. Also that temperature has a direct bearing upon this reaction. At the present time his company does not have a definite procedure established for opening up heats melting high in chromium. This is largely left to the judgment of the melter making the heat as he knows the melting conditions.

The problem before operators is: what can be done to oxidize out excessive chromium in the melt down when making heats with low chromium specification.

(a) The amount of chromium that can be oxidized out is unlimited:

(1) Recently his company had some mixed scrap in a charge. The melt-down preliminary analysis showed a heat with such a chemical analysis or composition that it could not be used without oxidizing out some of the chromium. The melt down analysis showed 1.89 chromium. But after the oxidizing process it was 0.48 chromium. Thus, 141 points of chromium was oxidized from the bath. To accomplish this required a number of slag-offs which involved excessive amounts of lime and ore, greater wear and tear on the furnace, longer heat time, and a higher Kw. consumption.

(b) The amount of chromium that can be oxidized out with the original oxidizing slag is limited:

(1) After considerable research in the melt shop the conclusion was reached that there is a definite relationship between the Cr_2O_3 (chromic oxide) in the slag and the lime-silica ratio. It was found that when the Cr_2O_3 is high in the slag, the lime-silica ratio is low, and vice-versa. In other words, the lime-silica ratio in the slag is directly proportional to the amount of chromium in the bath. Since this problem is still being examined, Minen was not in a position to state the limits wherein this relationship exists or changes.

(2) Naturally, if the lime-silica ratio remains constant, the amount of chromic oxide retained by the slag will increase if the volume of the slag is increased.

(3) This relationship coincides with similar findings of research being done in the open hearth department. Except it has been found in the studies to date that the control of the complete oxidation of the chromium to chromic oxide is erratic when comparing the reactions of heats from both departments. At the open hearth the reaction is very slow and can be more readily followed than at the electric furnace where the reaction is very rapid. Further, there is the question of the solubility of the various elements. This is especially true of lime. The results show a definite relationship, but until better control of this solubility is possible no definite ratio can be given. To date, it is believed that the ratio is in the vicinity of 1.30 to 1.70, or lower. It is found that the chemical analysis is not the complete answer as pan-cake readings appear much lower than the chemical analysis would indicate. The expectation is to find the limit by trying to carry the Cr_2O_3 in a very high lime slag. Naturally there is a limit to the amount of Cr_2O_3 that can be carried in an acid (low CaO-SiO) slag and also in a very basic (high CaO-SiO) slag.

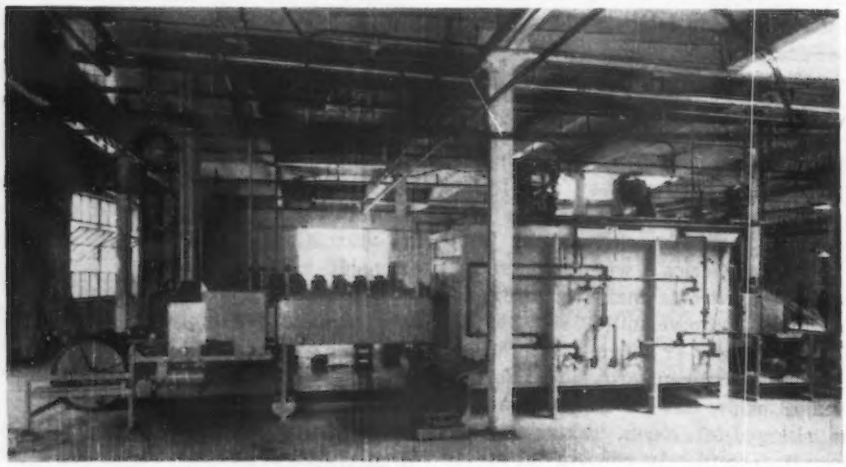
In conclusion Minen said that the best way to make a very low-chrome heat (0.15 Cr max.) is not to charge any chrome scrap.

New Equipment . . .

Heat Treating and Process Control

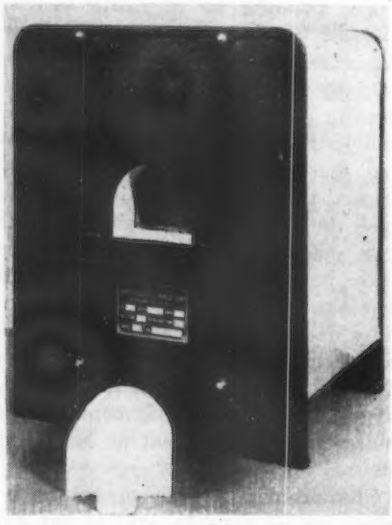
. . . Recent developments in heat treating furnaces, ovens, induction heating equipment, automatic controls and testing machines are described in the following pages.

A FURNACE in which coils of silver solder wire are clean annealed in an open fired chamber without the need for muffles or external atmosphere generating units has been announced by *W. S. Rockwell Co.*, New York. The furnace has a continuous mesh belt conveyor which carries the solder through an entrance vestibule, the heating chamber and the cooling section. The latter two are kept filled with the atmosphere formed by the burning of the gas in the furnace chamber. Such an atmosphere is also satisfactory for bright annealing and clean annealing of copper, brass, nickel silver and sterling silver products. The furnace can be equipped with an alloy muffle for bright annealing other materials which would require special atmospheres. Curtains on the charging and discharging end vestibules exclude air and keep a reasonably positive pressure within the furnace. The discharge retort is water jacketed for about a 5 ft. length which is followed by a water spray section for fast cooling of the work before discharge. Time of work in the furnace can be set for a range of 10 to 60 min.



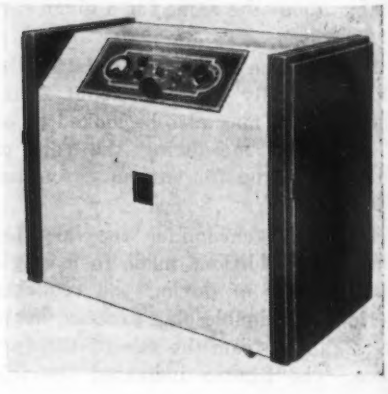
Electric Laboratory Furnace

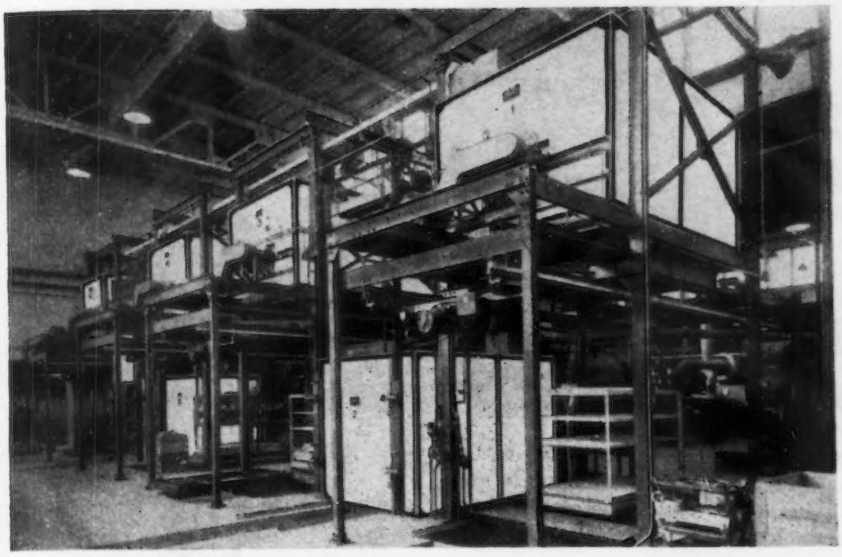
BUILT for industrial and school laboratory uses where materials are to be heated in an oxidizing atmosphere at temperatures above those attainable with metallic elements, a line of high temperature furnaces with maximum temperatures of 2750 deg. F. and operating temperatures of 2500 deg. F. have been announced by *Harper Electric Furnace Corp.*, Niagara Falls, N. Y. The furnaces are equipped with a silicon carbide muffle and are heated with Globar nonmetallic heating elements located above and below the muffle to assure uniform distribution of heat. Furnaces are made in many sizes with chamber dimensions of 2⅝ in. high, x 3½ in. wide, x 5 in. deep and 5½ in. high, x 6 in wide, x 18 in. deep.



High Frequency Generators

FOR both induction and dielectric heating loads, a line of high frequency generators with ratings of 1, 2, 5, 10 and 20 kw. in line with NEMA standards, has been announced by *Westinghouse Electric and Mfg. Co.* Completely self-contained, the units require only electrical connection to a 60-cycle power supply and have no external cooling or other auxiliaries. Units of 50 to 200 kw. capacity can be supplied in addition to standard one to 20-kw. ratings. The primary voltage is 220 to 440 volts, single phase for ratings of 5 kw. or lower and three phase for 10 kw. and higher. The high frequency section is completely shielded to minimize the possibility of interference with nearby communication circuits. An automatic timing control permits load cycle adjustment to a predetermined time which can be automatically repeated. The use of air-cooled tubes eliminates bulky water-cooling equipment and allows complete portability of the 2, 5 and 10-kw. units and increased portability of the 20-kw. unit. The air blower for cooling the tubes provides a circulation of air throughout the entire equipment. Generators are available for frequencies of 450 kc., 5, 15 and 30 mc. for ratings through 10 kw. and 450 kc., 2 and 10 mc. for 20 kw. and higher.



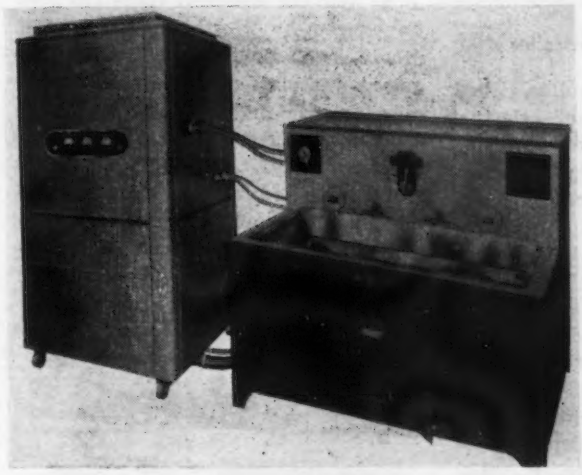


Aluminum Heat-Treat Ovens

A BATTERY of ovens for automatic handling and heat treating of aluminum castings has been developed by *Gehnrich Oven Div.* of *W. S. Rockwell Co.*, New York. This installation, which consists of four elevator type ovens supported on heavy structural steel framework, leaves ample clearance underneath each oven to permit easy loading and unloading. Underneath the loading station of each oven is a quench tank. The space between them is used for setting the rack or cage of work ready for raising into the oven while the cage of heated work is being cooled in the tank underneath. The oven is electrically heated and the heat is drawn from the heater sections by circulating fans and reinduced into the heating chamber at a recirculation rate of 58 complete air changes per min. The cage carries a work load of 800 lb. The installation also includes two lift door, box type, electrically heated, horizontal heat recirculation ovens used for heating at lower temperatures and for baking enamel finish on small parts.

Hardening and Quench Table

A GENERAL purpose two-station hardening and quench table used in connection with high-frequency induction heating generators and suited to a wide variety of machine parts requiring surface hardening or localized heating has been announced by the *Induction Heating Corp.*, 389 Lafayette Street, New York 3. It can be used either as a single purpose unit, using two identical features or as a general purpose table for various kinds of hardening operations, even where the lots may run as low as 6 or 12 pieces. A master 3-stage timer automatically controls the heating and quenching positions of



the cycle. A slight delay, if necessary, can be incorporated between the heating and quenching sequences. Hose connections which connect to quench rings that surround the part being heated permit a spray quench to be applied. Duration of the quench is controlled by the master timer that operates a solenoid valve. Rotary driven spindles are provided to assure uniform heating in connection with the hardening of parts such as gears.

Hot Air Burner

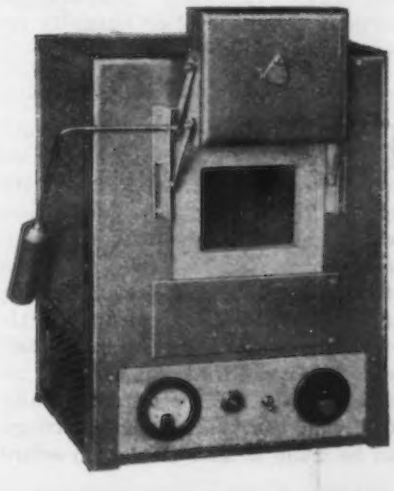
A HOT air burner suitable for high temperature applications for natural gas, coke oven gas, oil or tar fuel or mixed gas and air preheated to 600 and 1500 deg. F. application has been announced by *Bloom Engineering Co.*, 857 West North Avenue, Pittsburgh 12. The distribution vanes are said to provide uniform air flow with minimum air pressure. Operating pressure depends on air temperature—normally 0.10 in. water pressure and not greater than 0.50 in.

Electric Furnace Controller

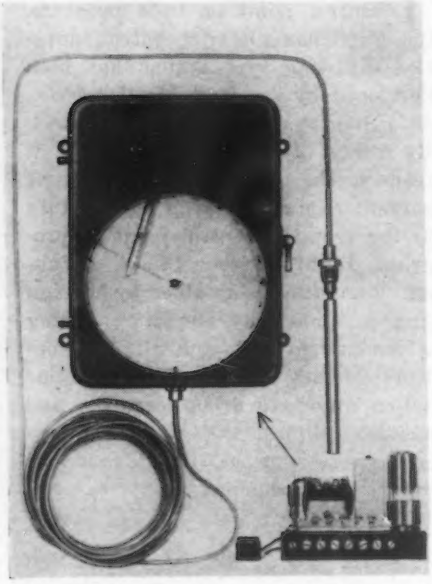
TO hold temperature at a selected control point or to a program, the Micromax electric control, duration-adjusting type system has been developed by *Leeds & Northrup Co.*, 4934 Stenton Avenue, Philadelphia 44. By means of an "On-Off" system, it feeds to the heating unit the electric current required to keep temperature to the required control point or program. Input is either full-on or full-off. Regulation is obtained by controlling automatically the time during which current is On and Off. The control provides full proportional time action, automatic droop correction and can be equipped with overshoot control valuable when the furnace or other unit is coming up to the temperature.

Electric Muffle Furnace

AN electric furnace, Model AFE, which provides temperatures up to 1850 deg., has been announced by *Thermo Electric Mfg. Co.*, 480 West Locust Street, Dubuque, Iowa. The furnace door is supported by two sets of parallel levers so that when opened it moves upward and out of the way. Close heat selection is provided by an automatic input controller mounted on the instrument panel. Other features include an indicating pyrometer calibrated to 2000 deg. F., a pilot light to indicate operation and an "On" and "Off" switch. The furnace is 21 in. wide, 31 in. high and 18 in. deep. The heating chamber is 5½ in. wide, 4½ in. high and 10½ in. deep. It is built



for operation on either 115 or 230 volt and is rated at 2000 watt.

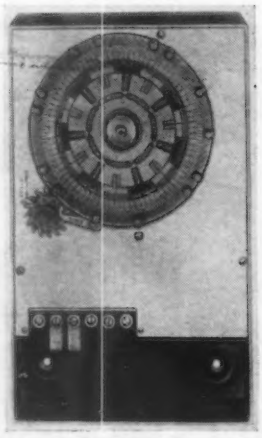


Electronic Type Controller

AN electronic type controller, called Bristol's "Free-Vane" electric controller, which operates on the shielding effect of a vane passing between two coils in an electronic circuit has been announced by *Bristol Co.*, Waterbury 91, Conn. Recording and indicating models are offered for automatic control of temperature, pressure, liquid level and humidity. Low-open, high-open, low-high, low-open-high and low-normal-high control is available. The controller for temperature is offered in ranges from —125 deg. F. to 1000 deg. F. The pressure controller is available in ranges from full vacuum to 6000 lb. per sq. in. and in addition is available for automatically controlling liquid level. The humidity controller operates from a wet and dry bulb type of element with separate control for each bulb. The controller is also offered as a time-program controller for automatically controlling temperature, pressure, liquid level or humidity according to a definite time schedule.

7-Day Time Switch

FOR timing automatic heat, ventilating, lighting, pumping or flushing operations, the Paragon 700 series, 7-day calendar, dial time switch has been announced by *Paragon Electric Co.*, 39 West Van Buren Street, Chicago 5. The switches are equipped with 6 in. calendar dials which make one complete revolution every 7 days. Dial trippers can be independently set for different daily "On" and "Off" schedules. Settings can be made in advance for an entire week. Any day or days operations may be omitted entirely on a pre-set program. The switch is graduated into hours and half hours. Day and night is distinctly separated. Operations from On and Off or from Off to On can be set as close as 3 hr. apart and can be separately adjusted throughout each 24 hr. day in the week.



Control Switch

A DURASWITCH in combination with the Ashcroft Gage has been announced by *Manning, Maxwell & Moore, Inc.*, Bridgeport, Conn. The gage had a slide rule dial easily readable for adjusting of the switch to the control point. Series E-100 are for pressure only. Series E-200, illustrated, are for both pressure and temperature applications, as a pressure control and pressure gage combination or temperature control and thermometer combination in single or duplex types.

Sand Muller

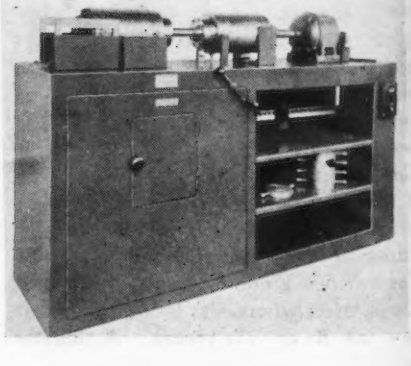
A PORTABLE, low-cost sand muller specially adapted for use in small foundries and to meet the mulling needs for special small batches in larger foundries, has been announced by *Beardsley & Piper Co.*, 2541 N. Keeler Avenue, Chicago 39. To operate the Mulbaro, sand is shoveled into the barrow which is then wheeled under the top portion or mulling unit which is suspended from a hoist. After being lowered, the upper unit is clamped to the barrow. The starter button is pressed and the mulling action is accomplished by rubber covered rolls, designed to conform to the curve of the bowl as they travel. The mullers knead and squeeze the sand and the plow action does the aerating.

Test Cabinet

THE dual temperature test cabinet for sub-zero and high temperature testing offers a new means to the laboratory and production facilities of war plants, according to *Revco, Inc.*, Deerfield, Mich. It will reduce the temperature in a 90 deg. F. room from 180 to —70 deg. in 6 hr. and raise it from —70 to 180 deg. in 1 hr. Temperature is automatically held between the two points to within 1 deg.

Fatigue Tester

THE *Southwark Div. of Baldwin Locomotive Work*, Eddystone, Pa., has produced an oversize rotating beam fatigue machine, designed to help "see around corners" in testing materials, based on published reports of studies which indicate that specimens of 1 in. minimum diameter eliminate size effect in fatigue. The new model SF-10 R rotating beam fatigue testing machine has a testing capacity from 0 to 10,000 in.-lb., adjustable by units of 5 in.-lb. bending moment by position of weight on beam. Specimen length is adjustable from 3½ to 9½ in.



How many hands does a turret lathe operator need?

— only two — if it's a Jones & Lamson

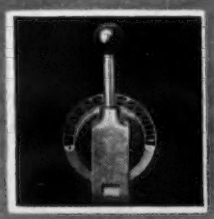
Many a turret lathe operator must have wished, at times, that he were like the six-armed deity of the Hindus, for faster-cutting tools have greatly increased the productivity of these machines and the burden upon the operator. The necessity for simplified controls to save waste motion and operator fatigue is, therefore, imperative!

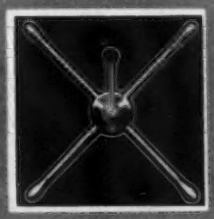
Jones & Lamson Universal Turret Lathes are designed not only to take full advantage of the fastest-cutting tools, but also to give every mechanical aid to the operator so that he can operate to the maximum capacity of the machine without undue fatigue.

We show here some of the man-saving, time-saving features built into these machines. Write to us for more detailed information and descriptive literature.

SINGLE LEVER SPINDLE SPEED SELECTOR

With direct reading dial, to control all spindle speeds. Next speed pre-selected while cut is in progress.





POWER TRAVERSE AND INDEXING OF THE HEXAGON TURRET

Turret of saddle type machines is power traversed and power indexed. A time saver and man saver too.

SINGLE LEVER FEED SELECTORS

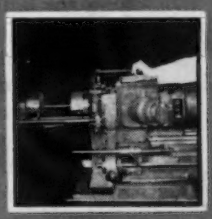
Controlled by single lever, direct reading, selectors. Feeds pre-selected while cut is in progress.

AUTOMATIC LUBRICATION SYSTEM

Requires minimum of attention. Flow of lubricant automatically increases as spindle speed increases.

AUTOMATIC COOLANT SUPPLY TO HEXAGON TURRET

A copious supply of coolant is pumped automatically to the working face of the hexagon turret.



SIMPLIFIED BAR FEED AND COLLET OPERATING MECHANISM

Operated by a single lever, which opens chuck, feeds in stock and closes chuck.

All these features and many others are incorporated as standard in Jones & Lamson Universal Turret Lathes.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Assembly Line . . . .

STANLEY H. BRAMS

• Export anticipations are substantial among auto men . . . Russia and China are reported set to make huge bulk buys of cars and trucks for delivery starting when the war ends.

LIGHTWEIGHT MODEL: *Ray Russell, president of the Detroit Industrial Designers' Association, displays the postwar automobile which he has just completed. Built largely of light metals, aluminum and magnesium, the gross weight is 1100 pounds. Russell calls it the "Gadabout."*

DETROIT — Export marketing officials in the automobile companies are beginning to think in detail about overseas operations after the war. Expectations are that a starved market abroad will provide a large volume potential.

Quite naturally, thinking on vague great expectations is mingled with thinking about definitely solid potentialities. There are notable straws of the latter sort. One of the most interesting is probably the report of arrangements being attempted for a tremendously large bulk sale of postwar model jeeps to Russia, perhaps under some sort of lend-lease arrangement.

Indications are that the Soviet has discussed this matter in a preliminary sort of way in Washington, and that soundings have been made on the subject at Willys-Overland. However, no commitments of any kind have as yet been made. Russia appears to be thinking in terms of need for a half-million or so jeep-type vehicles for internal use in agriculture and general use applications.

Volume like this would start the Willys works at Toledo humming to capacity, and would keep it on that plane for a few years if not a single other sale were to be made, domestically or otherwise. So it is probable if such a deal is consummated with Willys alone, deliveries would be staggered over a period of several years so that the Toledo company could move simultaneously to capture a share of other markets with a portion of its output. In fact, if Willys progresses in line with the highly optimistic anticipation of Ward M. Canaday, its chairman, and Charles E. Sorensen, its president, it might be so loaded with orders that it could be able to produce for the Russian buy only as a leading member of a manufacturing pool cooperating on the order. This possibility has been discussed, it appears, but in no way have any definite conclusions yet been drawn.

These postwar jeeps, incidentally, will be quite different from the Army variety. They will necessarily have a power takeoff if they are to fulfill the expectations in Toledo that they will double in brass as an all-purpose farm power package. They will be built somewhat larger on this same account, to be usable for routine hauling chores. They might even be available in a closed body type for buyers more interested in passenger car transportation than in trucking and agricultural employment.

Jeep-conscious Russia has a rival in China for bulk purchase of American automotive products. Washington reports say that one of the projects brought back from the Far East by Donald M. Nelson is Chungking's desire to enter the postwar automobile market for around 450,000 trucks and passenger cars during the five years after Japan is beaten. Hungry for necessary transportation, China would take many of these as second-hand jobs, and so there arises the prospect of simple transfer to China of many of the Army trucks which will be operating on the Asian front against the Japs and which continue serviceable at the end of the fighting.

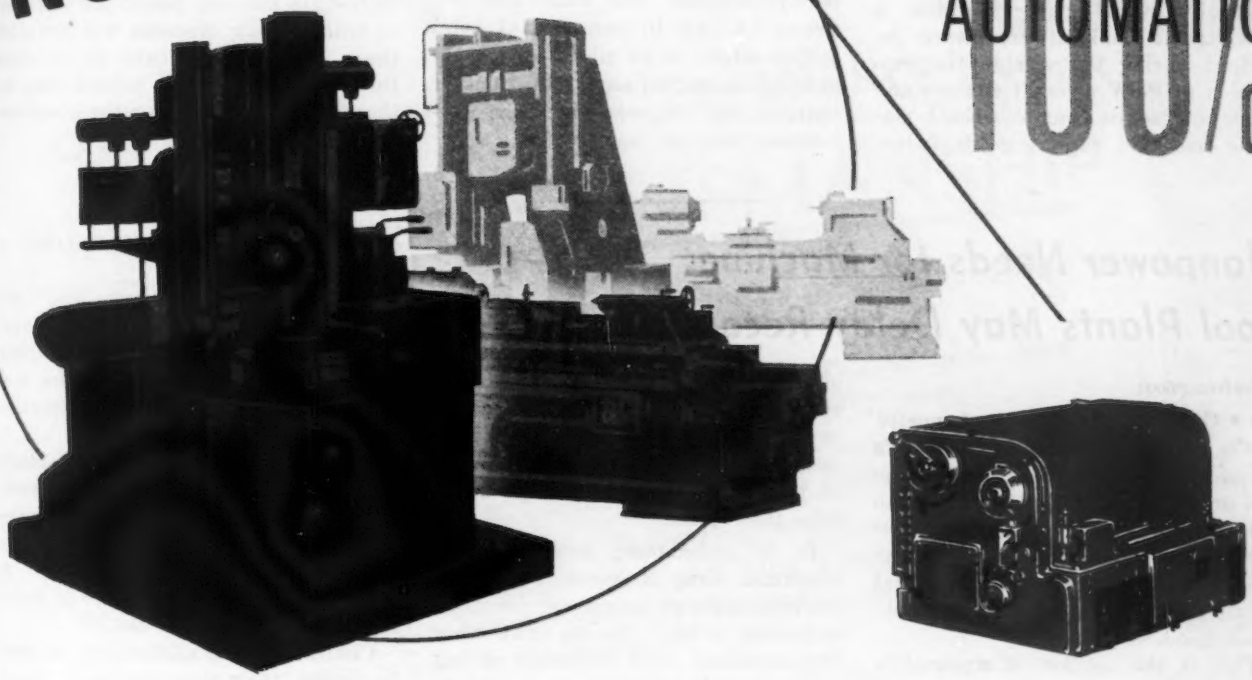
As a general signpost of developments, the Automotive Manufacturers Association has reactivated its export department, which was closed down at the start of the war. Named to manage the department last summer was Paul R. Mattix, formerly chief of the Automotive Division of the Bureau of Foreign and Domestic Commerce. Mattix is working out of Washington.

INTERNATIONAL competitive factors which have always prevailed in the world automobile market will probably be considerably different after the war. In the first place, it would seem that German cars, which enjoyed fair export markets on the European continent, will be produced in negligible volume if the close control anticipated over German industry materializes.

Personal letters home from former automotive men in Europe tell that such French plants as Renault, Citroen and others are in surprisingly good condition, with little machinery missing and conveyor lines largely intact. One letter stated that some plants are just as they were when France fell in 1940, with partially completed cars lined up along dusty assembly bays. Conceivably, if these reports are authentic, French plants may be able to move into production fairly rapidly and take an initial bite out of the world market, provided raw materials are available to them.

England reportedly has some ambitious plans for enlarging her share of the world market, which in size probably was next to those of the United States and Canada. As a center of manufacturing of truly small cars, due to horsepower licensing reg-

NOW... MULTI-PURPOSE MACHINES CAN BE 100% AUTOMATIC



A *revolutionary new production principle makes automatic control as versatile as manual control*

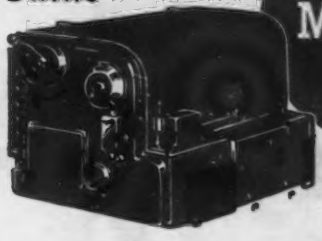
The Bullard "MAN-AU-TROL" principle of automaticity focuses at a finger tip the ability to get out of a machine anything that man's mind and muscles can get out of it ... without human or cumulative error.

Applied to a machine this principle would make possible the production of one part as long as required with continued accuracy ... *then in a few hours, not days* .. you could reset the control to turn out an entirely different part ... any size, any shape within the machine's limits.

So you see, the Bullard "MAN-AU-TROL" combines, for the first time, the greater production and lower costs of special-purpose automatic machines with the multi-purpose advantages of manually operated machines ... *plus* manual operation at a moment's notice.

The Bullard Company, Bridgeport 2, Connecticut.

The automatic control that is as versatile as manual control



BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

100% automaticity... no human or cumulative error... control to closest tolerances — *a tremendous cost advantage in competitive markets!*

ulations, England may have a definitely desirable product to sell in a world of war-reduced purchasing power.

There may be new entries in this world auto production race, also. For instance, Australian Consolidated Industries, Ltd., is talked of in export circles as a possible motor car builder after the war, which would mark an introduction to automotive manufacturing in the southern hemisphere. In any such manufacturing program Australia would have available a considerable bank of experience developed during the war in the production of P&W aircraft engines and would utilize its war-blossomed machine tool and capital goods industries. Export markets would be largely in New Zealand, South Africa, India and possibly China.

Even though there is a most pressing domestic demand for automobiles and trucks in the immediate postwar period, American manufacturers will likely divert a portion of their output to export channels, to maintain established distribution and sales facilities. As a working basis, it might be hypothesized that somewhere between 7.5 and 10 per cent of total output might be so allocated—dependent, of course, on any restrictions or controls over exports which the government may set up.

This would be about in line with prewar proportions of the market. In the five years 1935-1939 inclusive, including four months of European War, our automobile and truck exports averaged 9.61 per cent of total production. Normally passenger cars overshadow trucks in this market in a proportion of about eight to five, but the approach of war in 1938 and 1939 improved the relative truck position. It might be supposed that in the immediate postwar years, the number of trucks going overseas will parallel those of passenger cars or surpass them, rather than lag behind, due to the great world need for the commercial vehicles.

Manpower Needs for Machine Tool Plants May Delay Reconversion

Washington

• • • **Unless manpower** is channeled to the machine tool industry, WPB's proposed amendment of the machine tool order, E-1-b, permitting the auto industry and other industries needing bottleneck tools to stand on the same footing with other essential industries and lend-lease, will not do much good.

This is the opinion of automobile executives here who are scanning WPB Chairman J. A. Krug's proposal that the 25 per cent allocation of all tools to essential civilian users be squeezed up to include the demands of United States industries as they reconvert. Preference ratings would be removed from 25 per cent of tool production and scheduling of orders on the basis of time of receipt would take their place.

It is understood, however, that Chairman Krug is considering giving the tools industry manpower priorities to recoup, in part, the one-third labor loss sustained since December of last year, when heavy cutbacks in industry caused a migration of workers to other pursuits.

Order backlogs remain at $195,000,000 while shipments are averaging only $35,000,000 to $40,000,000 a month.

If manpower referrals are not made quickly, reducing the backlogs, auto men feel that the WPB order will only serve to aggravate the tool supply situation for all essential civilian buyers.

The Armed Services painted a black manpower picture at WPB last week when they said that the 200,000 manpower shortage reported in the early part of the summer still persists. A different 200,000 workers are in short supply, it was pointed out.

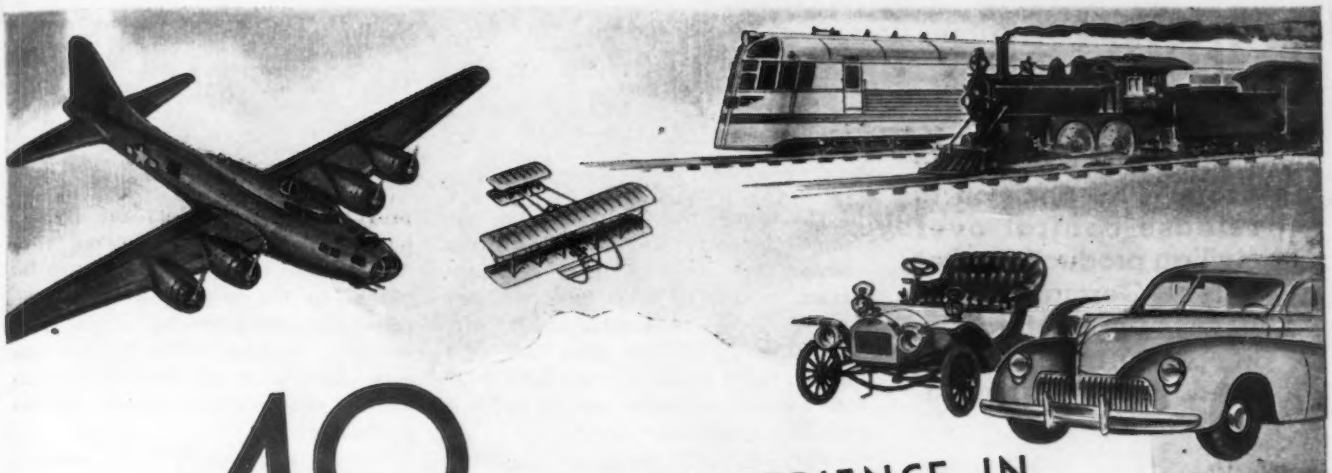
Chairman Krug said on Oct. 12 that he hoped that this shortage would not continue to the end of the war, but declared that as cutbacks are made war orders take their place.

The Automotive Council for War Production has recently said that unless advance determination is made with respect to plant clearance, what plants may be sold and what tools may be retained by the companies, reconversion of the automobile industry may be delayed 6 to 9 months.

Reconversion moves contemplated by WPB were outlined by Mr. Krug. He said that if the war continues through the winter, the spot authorization procedure would have to be expanded. One method of expansion which is now being considered is to permit companies employing as few as 250 workers to resume production at will with all controls removed.

Filling up the civilian pipeline by permitting component manufacturers and makers of other on-the-shelf-goods to reconvert ahead of the makers of end products after X-Day, is also being considered, Mr. Krug said. He reported progress in the WPB effort to tailor cutbacks to free the most important segments of industry after X-Day.

NORMANDY REPAIR SHOP: *GI mechanics install a motor in a U. S. Army vehicle as it passes along the "assembly line" at a field ordnance depot in Normandy, France. Yankee ingenuity again solves a problem by putting mass production methods in the field.*



OVER 40 YEARS' EXPERIENCE IN PRECISION-CRAFTSMANSHIP

●Murchey has a record of experience and a tradition in precision-craftsmanship which give it a unique position in American industry.

It is also significant that 35% of Murchey's plant personnel have been Murchey men continuously for ten, fifteen—and even twenty years.

What this means to those industries in which quick, accurate threading is indispensable to quality and to quantity production is strikingly apparent.

Murchey's Self-Opening Die Heads, Collapsible Machine Taps, Thread Milling Machines, Tapping Machines, Bolt and Pipe Threading Machines and other threading tools, are recognized as the standards by which all threading equipment is judged and evaluated.

And when problems arise in which threading is an important element, industries faced with such problems turn invariably to Murchey as the organization best qualified to provide an adequate solution.

It has been a Murchey tradition never to "rest on its oars"—never to become complacent—but always to "keep well ahead of the times." Today, as in the post-war world, Murchey pledges its resources, trained skill and engineering leadership to maintain that tradition. Past, present and future —the saying always holds true—YOU CAN DEPEND ON MURCHEY.

MURCHEY MACHINE & TOOL COMPANY
DETROIT 26, MICHIGAN

MURCHEY

Washington . . .

L. W. MOFFETT

• Uncertainties arise over WPB's decision to release control over civilian production after fall of Germany . . . Bowles' price formula, keeping prices at 1942 level, meeting opposition.

WASHINGTON—While WPB's decision to release control except for military requirements over civilian production upon the fall of Germany has been hailed as wise, it has puzzling uncertainties. Until Japan is defeated there is no way to avoid the resulting system whereby industry's production is partly controlled and partly freed. This brings about inescapable inequities and war being what it is they cannot be ironed out. They can disappear only with the end of a "global" war and not with the conclusion of only one part of it. Hence some plants will be freed of war contracts and cleared for civilian production while competing plants will be entirely or partially under Government control, forced to forego commercial markets or able to enter them only on a limited scale. Such a situation may well affect the competitive position of such manufacturers to the disadvantage of those which were compelled to continue on war work.

Acting WPB Chairman J. A. Krug has foreseen the probability of such a situation rising and has shown good faith in trying to smooth it out as nearly as possible but concedes that WPB does not have the answer except to say that it will be ameliorated as much as possible.

He directed attention to the problem when he said at a recent press conference that there are a number of points on the forthcoming 40 per cent cutback in war contracts that WPB is not in the best place to be active.

"Certainly the Army, having obtained the cooperation of a great many competitive concerns in a war program in cutting them back will try to give them a reasonable break," Mr. Krug said. "I am quite sure the Army isn't going to cut back half the competition there and try to hang onto the other half."

Further complicating the problem of the resumption of civilian production is the fact that, even after the WPB Production Executive Committee reviews and makes projected cutbacks effective, it is faced with continued price and wage controls under war emergency acts. Without release or at least relaxation of these laws, there can be no integrated pattern of untrammeled civilian production. Yet, while moves have been made by industry in anticipation of turning to civilian production, to get relief from these two wartime laws, the Smith-Connally law and the Price Control act, such an adjustment presents difficulties. Under the Smith-Connally act, WLB is empowered to settle industrial disputes. Under the Price Control law, WLB is the President's agent in keeping wages in line. Apparently if civilian production is to get from under WLB jurisdiction in connection with disputes and returned to the jurisdiction of NLRB, Congress will have to amend this act, which as enacted is to continue until six months after the war ends. That Congress will do so seems improbable.

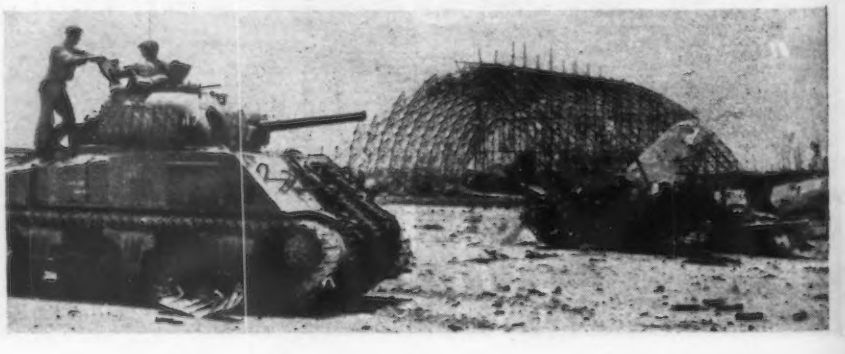
The Price Control act as passed, sets June 30, 1945, as its expiration date but it is expected that it will be continued until the war ends. Relief from both labor and price controls, however, without legislation is provided by War Mobilizer Byrnes, but it will be done by setting up a dual system of controls that are inherent in the transition from complete war operation to civilian production. It appears to be the best way out but it is obvious that no healthy economy can operate on two levels.

Higher wage costs have made it necessary for manufacturers in many lines to ask prices above the OPA ceiling. Mr. Byrnes has recognized this fact in authorizing such prices on civilian output and at the same time he has authorized return to the 40-hr. week, which serves the double purpose of increasing employment and eliminating time-and-one-half pay for overtime such as is encompassed in the 48-hr. week which applies to war production.

Mr. Krug stated the obvious when he said that a manufacturer isn't going to be enthusiastic about producing civilian goods that allow no profit. He also made the assumption that the prices will be adjusted equitably as between civilian goods so that it will be possible to get the benefit of "this tremendous flow that is certain to follow when all these resources are released."

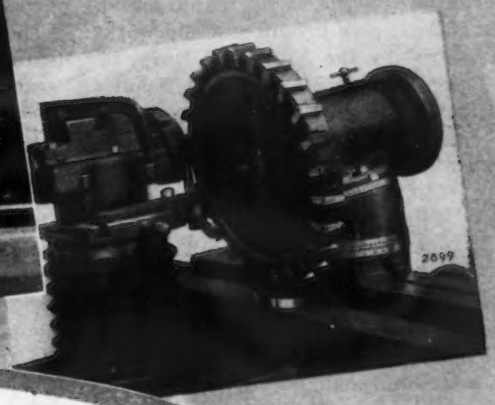
Meanwhile, OPA Administrator Chester Bowles' price formula to keep civilian prices at the 1942 level has met with a great deal of opposition. The argument is made that such a formula will upset the nation's economic structure and that the solution is to fix prices at the manufacturing level. By so doing, it is contended, all factors, including wage readjustments, such as a shift to the 40-hr. week and increases in hourly rates,

PACIFIC AIR FIELD: *A Marine-manned tank takes its position on the recently captured Peleliu airfield in the Palau Islands. The infantry will dig in to protect the newly won field while it is put in shape for our planes.*

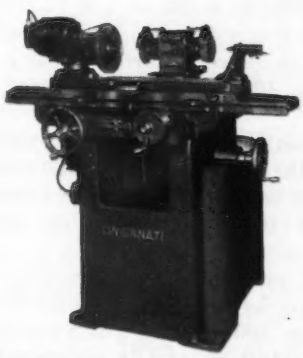


Left: Sharpening a pencil sharpener cutter. The technique employed here is to lock the table, and slide the cutter on an arbor held between the two tailstock centers.

Below: Grinding the face of the teeth of a 16" diameter face milling cutter, with the aid of the Face Mill Grinding Attachment.



You Can Sharpen Both of These Cutters on a CINCINNATI



● CINCINNATI No. 2 Cutter and Tool Grinder. Complete specifications may be obtained by writing for catalog M-962-2.

CINCINNATI No. 2 Cutter and Tool Grinders have the capacity and versatility of adjustments for grinding a wide range of sizes and types of cutters. Two extremes are shown here. The pencil sharpener cutter demonstrates the convenience of the universal tooth rest; the face milling cutter and attachment demonstrates the capacity of the machine to support a heavy load, yet the table can be moved along its ways with a light push with one finger.

Principal specifications are listed in our general catalog M-995-2.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, 9 OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... CUTTER SHARPENING MACHINES

would be taken into account. This is in effect the policy proposed by Mr. Byrnes. The Byrnes plan proposes a sliding percentage scale by which producers could include new cost factors in civilian manufacture that have developed under war production.

* * *

Termination inventories are out of the control of the new Surplus Property Board very largely and this is worrying SWPA's present officials. Permitted purchases by manufacturers of their own inventories and work in process by the Army and Navy, it is feared, will result in a glutted market before the new Surplus Board can swing into action and make the rules for orderly disposal.

* * *

At WPB, the feeling is gained that it is going to be very difficult to get the government out of business after X-Day. While the War Department has scheduled a 40 per cent cutback, WPB feels that at least 15 per cent in addition should be cut upon the fall of Germany. WPB contentions along this line are receiving very little encouragement from the services. In fact one WPB official has said that they are being "laughed at."

* * *

Curiously enough the demobilization report endorsed by the President on July 30 of last year advocates the slow termination of contracts so that civilian workers can readjust to peacetime production more easily. This report was transmitted by Frederic A. Delano, head of the now defunct National Resources Planning Board, which was wiped out by Congress in 1943. This policy was also advocated by the National Resources Planning Board's main report, also signed by Mr. Delano who is the President's uncle.

The demobilization report, coincidentally, says that men should be returned to civil life gradually and that the cost of maintaining them in the services would be no more than providing civilian relief.

* * *

Hopes are being voiced at WPB that whoever succeeds War Mobilizer Byrnes will merge all of the war agencies in the interests of speedy demobilization. It is being regretted that former WPB Chairman Donald M. Nelson relinquished controls to ODT and WMC and to the Army and Navy on procurement when it would be very handy to have these agencies under WPB authority in working out reconversion problems.

Perhaps the Reconversion bill will have to be amended to permit these changes in operation. WPB officials see clearly that it would be very helpful if WPB were permitted to take over OPA so that new production and price problems could be settled simultaneously.

* * *

Former heads of the WPB Steel Division, Carl Adams, H. G. Batcheller and John T. Whiting, including other officials who have left in the past year, such as former Assistant directors David Austin, Jesse Honeycutt, Joseph Block and Charles Longfield attended a testimonial dinner given to ex-WPB Chairman Donald M. Nelson at the Statler Hotel on Oct. 18. Steel Division Director Norman Foy and Assistant Director William Todd headed another group of steel officials who also attended. The dinner was sponsored by WPB Chairman J. A. Krug to honor Mr. Nelson for his part in heading WPB during the most crucial stages of the war.

* * *

It is reported that Sidney Weinberg, Wall Street investment broker and former aide to Mr. Nelson who resigned after WPB executive vice-chairman Charles E. Wilson did, is getting together a testimonial dinner for Mr. Wilson in New York on Oct. 20.

* * *

WPB Steel Division officials report that a study now underway of the steel expansion program will reveal that the industry started installing new facilities in anticipation of war demand as early as 1939. More than $1,000,000,000 worth of new facilities were industry-financed and a large part of these were started as early as January, 1940.

* * *

Without knowing precisely what it means the following WPB statement is quoted because it projects the sound doctrine of preparedness of some sort.

"OCR previously had been allotted 4500 tons as a special supplemental allocation, 4000 tons of which was for the manufacture of bed springs and 500 tons for use in event of a disaster."

THE BULL OF THE WOODS — BY J. R. WILLIAMS

BALONEY! WHY SHOULDN'T I GIT AS MUCH DOUGH AS YOU? THIS MACHINE DOES TH' SAME KINDA WOIK, ONLY ABOUT TEN TIMES AS MANY JOBS! SMALLER, BUT TAKES TH' SAME BRAINS!
BUT YOU AIN'T GOT NO RESPONSIBILITY! WHY, IF I MADE A MISTAKE ON ONE O' THESE IT WOULD COST TH' COMPANY HUNDERDS, WHERE IF TH' WAR LASTS MUCH LONGER YOU KIN BUY THEM THINGS YOU'RE MAKIN' IN TH' FIVE AN' TEN!
THAT'S JUST WHY THEY'LL NEVER BE ABLE TO GIT TH' WORLD PEACE SETTLED--HUMAN NATURE!
PART OF THE WORLD PEACE
J.R.WILLIAMS 10-20
TM. REG. U. S. PAT. OFF. COPR. 1944 BY NEA SERVICE, INC.

Dnieprostroi Power To Be Supplied By General Electric

Schenectady

• • • **International General Electric** will supply nine 90,000 KVA generators for the USSR Dnieprostroi hydroelectric plant, according to a recent announcement.

Why pay more for **THIS**

When you can get **THIS**

and quickly grind to **THIS**

Specify STANDARDS *for Maximum Savings.*

With Standard (Universal-purpose) Carboloy Tools in your tool crib, you are prepared to meet your carbide tooling requirements in three ways: (1) You can use Standards "as is" for a large percentage of your general machining; (2) you can quickly grind minor variations when required; and, (3) for emergency tooling, you can adapt Standards to highly specialized shapes, even intricate forms, to meet urgent needs. Modern techniques for grinding carbides (training film strip available) permit amazingly rapid grinding. Conversion to special angles usually requires but little more than ordinary regrinding of dull tools.

Hundreds of leading plants have found Standard Carboloy Tools the answer to maximum convenience and economy in carbide tooling. Available in 10 styles, all commonly used sizes, and 5 grades for cutting steel and all other metals and non-metallics.

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Birmingham · Chicago · Cleveland · Detroit · Los Angeles · Milwaukee · Newark
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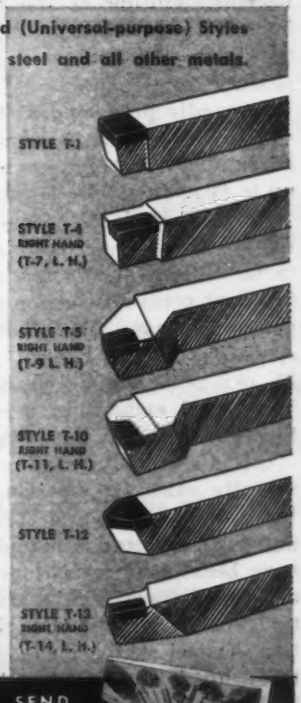
(Also sold through many leading Mill Supply Distributors)

★ 10 Standard (Universal-purpose) Styles for cutting steel and all other metals.



CARBOLOY TRADEMARK

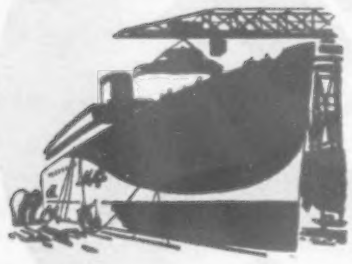
STANDARD TOOLS & TIPS

SEND FOR FREE CATALOG GT-175

"You ALWAYS Get Standards FASTER Than 'Specials'"

WEST COAST . . . OSGOOD MURDOCK

• Only manpower impasse prevents Geneva Mill from increasing plate production to 60,000 tons, its rated monthly capacity . . . Over 1000 local women help man mill.



SAN FRANCISCO—Geneva Steel plans to light its sixth open hearth this week. Operating at present with two out of three blast furnaces and five out of nine open hearths, igniting of the sixth open hearth should increase ingot production over the estimated break-even point.

Currently producing at the rate of 45,000 tons a month, schedules originally called for production stepped up to 60,000 tons for November.

Chief obstacle to achievement of this figure is the coastwide occupational ailment—manpower shortage—in direct contradistinction to womanpower shortage. The Geneva mill is operating at the present time with 25 per cent women on its payroll. With 4000 employees, over 1000 of them are listed on the distaff side.

Officials of the operating company, recently made application to WMC for a higher manpower priority rating. The application is understood to have been made in conjunction with, and the approval of, the War Production Board. Despite the critical position of steel on the Pacific Coast and the acute labor shortage, the appeal is still pending.

After an extended personal tour and intensive study of Geneva's present position and future prospects, Robert C. Elliott, postwar editor of the *San Francisco News*, declares that Geneva can operate successfully at two-thirds capacity. This suggests that as its share Geneva must sell postwar, 600,000 tons of finished steel annually. Estimating Geneva's potential market at 100,000 tons of plate, 100,000 tons of structural shapes and 400,000 tons of sheets and tin plate against a pre-war consumption of 2,400,000 tons on the West Coast (with no allowance for increased population), Elliott pulls the figures down from the astronomical to the practical and says that the West bets that Geneva will operate postwar.

When Basic Magnesium at Las Vegas, Nev., closed down tight recently, recruiters rushed in, hoping to secure over 200 miners, so badly needed. But, it is understood, USES regulations and policy prevented referrals of this comparatively nearby labor now idle.

Geneva is currently operating on a 50 per cent hot metal and 50 per cent scrap charge, so that every ton of iron diverted for West Coast foundry or other non-local hearth use reduces plate production by two tons. It is currently understood that open hearths at Fontana are currently being charged 75 per cent hot metal and 25 per cent scrap, in spite of high sulphur ore, shipments of limestone from Utah, coal from Oklahoma and foundry iron shortage on the West Coast, along with the surplus of high grade open hearth scrap in southern California.

FIXED-PRICE contracts to supersede the incompleted portions of cost-plus contracts are recommended by Edgar J. Kaiser, vice-president and general manager of the three Kaiser shipyards in the vicinity of Portland.

This change, also being sought by Eastern shipbuilders, would place yards in a better competitive position, Mr. Kaiser believes.

Throughout the period of wartime shipbuilding, competitive pricing has been difficult to obtain because there was no cost history for the ships we were building. Designs were being changed continually to meet war requirements, and shortage of manpower resulted in certain regulations that had to be met without regard to cost. With more stabilized costs and labor conditions, a fixed price policy becomes possible and desirable, according to Maritime shipbuilders.

Wage rates in non-manufacturing industries in the Puget Sound area were the highest in the United States, and in manufacturing industries the fourth highest in the spring and summer of 1943, according to J. W. C. Harper, regional wage analyst of the U. S. Department of Labor. In manufacturing wage rates Portland, Ore., ranked third and the San Francisco Bay area, fifth.

Rate of wage increase in these areas was lowest for the period of

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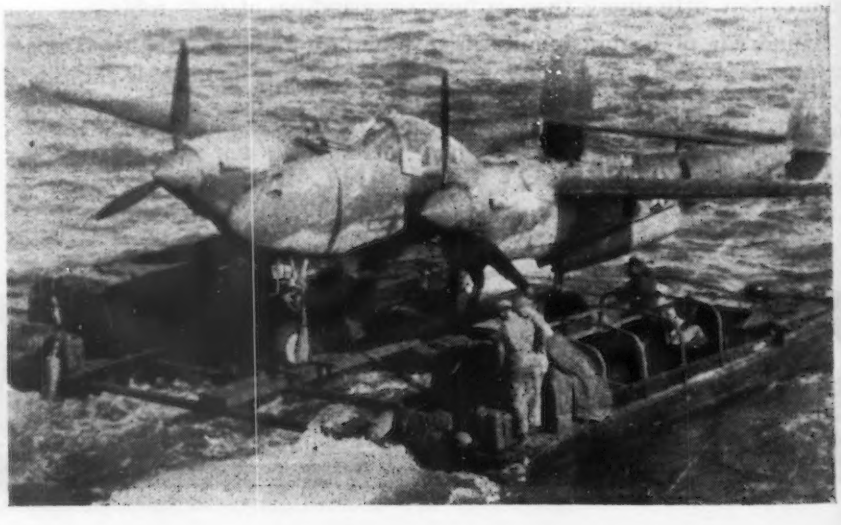
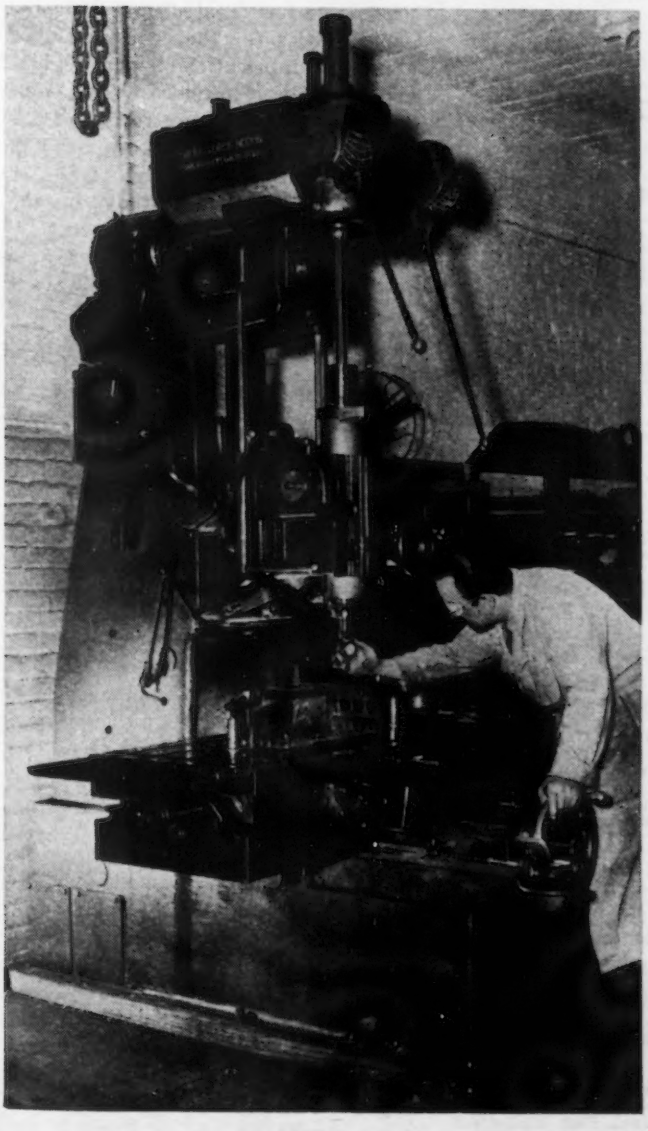
VIA DUCK: *In the South Pacific, two Army "ducks" which have been lashed together kick up a white wake as they transport a P-38 fighter plane from ship to shore. This method of unloading makes possible the transportation of fully assembled planes.*



Where accuracy is a first objective

FOSDICK JIG BORER



ARMY E NAVY

● One of the most essential functions in tool-die and fixture work is obtaining and maintaining extremely close tolerances. On drilling—boring—and reaming operations Fosdick Jig Borers are doing a real job on precision work in tool rooms and tool and die shops all over the country.

Designed for ease of operation — built rigidly to meet all accuracy demands — provided with a wide range of feeds and speeds — Fosdick Jig Borers offer exceptional versatility of operation.

Moderately priced this machine not only meets the close tolerances demanded on war time production but does it more economically.

If your work calls for precision boring, drilling, reaming or similar operations—put it on a Fosdick Jig Borer.

Full design and construction details and several typical job installations are contained in the Fosdick Jig Borer bulletin.

Write for your copy today.

★

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

April, 1943, to April, 1944. Reasons for the low rate increase are the original high rate and wage stabilization in the preponderant shipbuilding industries.

A possible three-year shutdown of Arizona copper mines has been averted, according to Philip R. Bradley, chairman of the State Mining Board of California, with the passage last week of the Surplus Property Disposal Bill. Present visible supply, including salvage of war material, and rate of production, if left unregulated, would have posed a serious problem for the industry, but there is now less ground for apprehension, Mr. Bradley told the Mining Association of the Southwest at a meeting in Los Angeles last week.

Among other requests and recommendations of the meeting was one for the allotment and stockpiling of tungsten, to permit continued operation of these mines.

AFL machinists surprisingly emerged victors in the fourth and final round of union voting at Douglas Aircraft Co.'s Santa Monica plant last week. Score was 62.7 per cent for IAM and 36.5 per cent for CIO United Auto Workers. Out of 11,000 employees, 90.2 per cent of those eligible voted.

In an election held 10 days earlier 25.6 per cent had voted for no union, 35.3 per cent for AFL and 38 per cent for CIO. In the run-off between the two winners, also under NLRB auspices, apparently all "no union" voters and a few from earlier CIO ballots switched to decisive AFL preference.

Senator Pat McCarran of Nevada picked up a hot potato at a regional conference on the decentralization of industry when he recommended that DPC plants in the East and Northeast be held inactive pending disposal or reconversion of corresponding plants in the West and the South. The storm of protest from Western industrial leaders equalled that from the East. This potato has apparently been dropped.

Senate to Investigate The Iron and Steel Industry Once Again

Washington

• • • **The iron and steel** industry has been slated for an investigation before the Senate Small Business Committee, headed by Senator James E. Murray, Democrat of Montana. At the Capitol for a brief visit on Oct. 14, after ending political speaking engagements in the East, the senator indicated that steel and other industries would be called before the committee in the course of hearings "During the coming months." He said that the hearings will deal with the varied questions affecting the present and future of small business in America.

The first of the series of hearings will relate to the problem of disposal of machine tools that the senator said can be employed to modernize thousands of small metal working companies and the disposal of consumer goods, which are badly needed to fill the depleted shelves of small retailers.

A second set of hearings contemplated, Senator Murray announced, will deal with the relationships between manufacturers and distributors.

"We think there should be a full public discussion of the oppressive trade practices frequently employed by large manufacturers in relation to the thousands of small distributors who handle their products," the senator stated.

A third set of hearings, to follow investigation of the steel and other industries, will deal with the aluminum industry and the opportunities for new enterprises as a result of its wartime expansion.

"The thousands of fabricators in the aluminum industry are dependent for their existence on the price of aluminum raw materials," Senator Murray pointed out. "The opportunities for the development of a vast number of new enterprises are likewise dependent on the same factor. The wartime expansion of aluminum production has created unprecedented opportunities for the development of aluminum fabrication in new regions and probably at lower cost. We want to explore the postwar future of the aluminum industry, not as a witch hunt against monopoly, real or imagined, but as a study in the opportunities for expanded employment which is so necessary to the postwar solution of our national problem."

Cited for Awards

The Quaker Oats Co., The Quaker Oats Ordnance Corp., Cornhusker Ordnance Plant, Grand Island, Neb.
The Ready-Power Co., Power Plant Division, Detroit.
Simpson Logging Co., Logging Division and Reed Mill Division, Shelton, Wash.
A. G. Spalding & Brothers, Inc., Brooklyn Plant, Brooklyn.
Standard Pressed Steel Co., Jenkintown, Pa.
The Star Drilling Machine Co., Main Plant, Akron, Ohio.
United Air Lines, Inc., United-Cheyenne Modification Center, Cheyenne, Wyo.
Vernay Patents Company, Yellow Springs, Ohio.
Lebanon Shirt Co., Union, Miss.
Minneford Yacht Yard, Inc., City Island, N. Y.
National Gypsum Co., Bluebonnet Ordnance Plant, McGregor, Tex.
National Iron Works, San Diego, Calif.
New England Box Co., F. M. West Division, West Springfield, Mass.
Northern Feather Works, Inc., Chicago, and Newark, N. J.
Panocular Corp., Cincinnati.
Peden Steel Co., Raleigh, N. C.
Plymouth Cordage Co., North Plymouth Plant, North Plymouth, Mass.
Q-O-S Corp., New York.
Remington-Rand, Inc., Plant No. 10, Tonawanda, N. Y.
Rudy Furnace Co., Dowagiac, Mich.
Seeger Refrigerator Co., St. Paul, Minn.
Spevack & Garbaccio, Inc., East Rutherford, N. J.
Stephens Brothers, Inc., Stockton, Calif.
Sylvania Electric Products, Inc., Brookville Plant, Brookville, Pa.
Truscott Boat & Dock Co., St. Joseph, Mich.
The Weldon Tool Co., Pump Division, Cleveland.
Westinghouse Electric & Mfg. Co., Lamp Division, Bloomfield, N. J.

Labor Recruitment In Steel Industry To Get New Controls

Washington

• • • **A plan for** controlling labor recruitment and reference has been submitted to the steel industry by Russell J. Greenly, WPB Steel Division Manpower Consultant. The plan is aimed at preventing manpower priority confusion and conflicting interregional recruitment. It is to be followed unless objections are received from industry.

The plan follows:

1. In the future the Steel Division would not request inter-regional clearance unless the labor obtained by this method is for manning new facilities required in the war effort.

2. Once inter-regional clearance is gotten, the Division would ask that a sufficiently high priority rating be extended to allow the recruiting industry to get workers in the regions to which it is assigned.

3. Before inter-regional clearance is requested steel producers with the aid of regional and area manpower directors, would be required to exhaust all efforts to recruit locally.

THE B-29

STARTS LIFE IN A CAMERA'S LENS!

A correspondent asks: "How can they make so many B-29 parts in so many different plants and still get a perfect 'fit' on the assembly line?"

Photo templates are the answer. In one of the big Boeing plants draftsmen draw details of the Superfortress on a series of master patterns. These are ARMCO Galvanized PAINTGRIP sheets—painted pale green.

PHOTOS ON STEEL

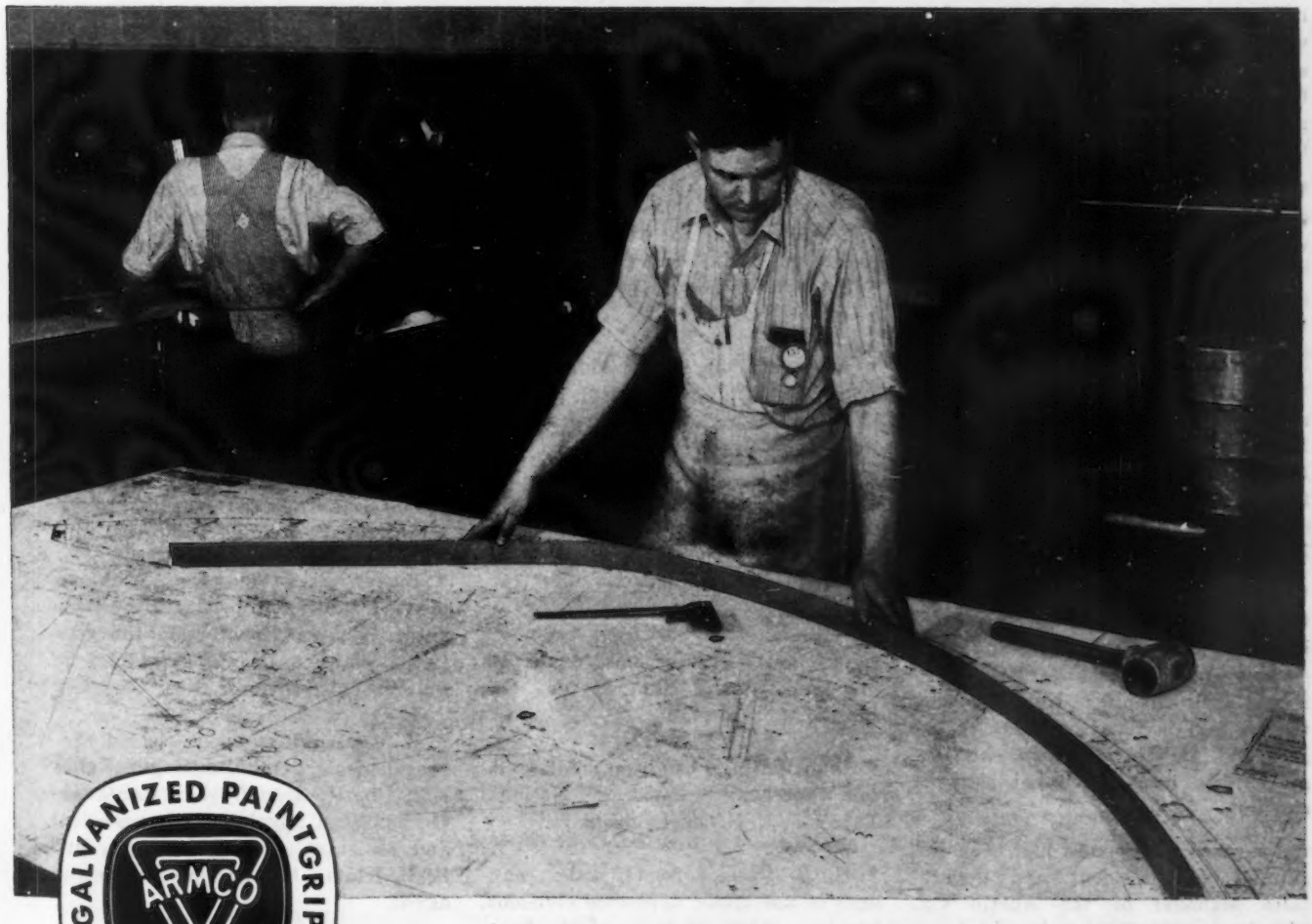
Next the master steel patterns are sent to the copying rooms. Negatives are made and a camera "shoots" the drawings on other PAINTGRIP sheets coated with photographic emulsion. These templates then go to subcontractors in all parts of the country.

This method insures faster template production; reproductions are accurate to one-thousandth of an inch per foot; more Superforts are ready to bomb Japan.

Here are six reasons why thousands of tons of ARMCO PAINTGRIP have been used for aircraft templates: *1. It has a protective galvanized coating. 2. The neutral phosphate coating on the zinc takes and holds the paint. 3. It is smooth, flat and easy to work. 4. There is no flaking or peeling of paint along scribed lines. 5. There is no chance of error in copying. 6. Extra wide sheets are available.*

Whatever you make of sheet steel that is to be covered with an *attractive and durable* paint or enamel finish, ARMCO Galvanized PAINTGRIP sheets are a wise choice. Let us show you just why. The American Rolling Mill Co., 3231 Curtis St., Middletown, O.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION



Checking contour of a body frame section.

THE AMERICAN ROLLING MILL COMPANY

PERSONALS

J. K. THOMPSON, assistant manager, American Bridge Co.

• **J. K. Thompson** has been promoted to the position of assistant manager of the Gary, Ind., plant, American Bridge Co., U. S. Steel Corp. subsidiary. Mr. Thompson, who participated in the construction of the Gary plant which began in 1909, has had 43 years' service with the American Bridge Co. Immediately prior to his present appointment he was assistant to the manager of the Gary plant.

• **A. F. Colling, Jr.**, assistant manager, sales, Sheet and Strip Steel Division of the Weirton Steel Co., Weirton, W. Va., has been appointed manager of sales of National Steel Products Co., Houston, Tex., a subsidiary of National Steel Corp.

• **A. F. Sprankle** has been appointed metallurgical engineer in the Timken Steel & Tube Division, Timken Roller Bearing Co., Canton, Ohio. He was formerly manager of the alloy bureau of Carnegie-Illinois Steel Corp. in the Pittsburgh district.

• **Lester C. Stork**, factory manager has been advanced to vice-president in charge of manufacturing and engineering, Kelley-Koett Mfg. Co., Covington, Ky.; **Clifford E. Kohlhepp**, controller, has become assistant to the president, and **David Sussin**, chief engineer has been appointed chief of research.

• **Laurence E. Cooney** has been appointed vice-president and general sales manager of the Austin Co., Cleveland. Mr. Cooney has been associated with the company for more than 25 years, serving as office manager, district construction superintendent and district sales manager.

• **Charles G. Purnell** has been elected vice-president in charge of sales, Tate-Jones & Co., Leetsdale, Pa. Mr. Purnell was formerly with the Carnegie-Illinois Steel Corp.

• **Elliott Taylor**, who recently resigned as director of the Automobile Rationing Division of the OPA, has been made an assistant general sales manager of the Packard Motor Car Co., Detroit. Mr. Taylor has served with International Harvester Co. in advertising and sales work, and in 1937 joined General Motors Corp. as a district sales manager.

• **F. A. Chidsey** has been appointed district sales manager of the Washington office, Jones & Laughlin Steel Corp., Pittsburgh, succeeding **H. B. Shepherd** who is on temporary leave of absence.

• **William D. Little**, vice-president of Hoskins Mfg. Co., Detroit, since 1940, has been elected president, succeeding the late Albert L. March. **Austin G. Melcher**, general superintendent, has been appointed vice-president, and **Arthur B. Tilton**, production manager, has been made a director.

• **Harold A. Hintz** has been appointed district manager for the West Coast territory, H. K. Porter Co., Inc., Pittsburgh, with headquarters in Los Angeles.

• **Albert R. Zelt**, vice-president of Oil Well Supply Co., Oil City, Pa., has been transferred to Dallas. **Ralph W. Rager** and **Byron Hinderer** have been promoted to comptroller and assistant comptroller, respectively. Mr. Rager has replaced **Russell M. Braund**, recently transferred to American Steel & Wire Co., Cleveland.

• **William Moss** has been appointed to the newly-created post of export manager by the Cling-Surface Co., Buffalo.

• **John W. Price** has been made assistant purchasing agent of National Tube Co., U. S. Steel subsidiary.

• **M. B. Ross**, formerly sales manager of the traffic appliance divisions, has been made manager of the heating device and fan divisions, General Electric Co., Bridgeport, Conn.; **R. O. Fickes** has been appointed manager of the clock division.

A. J. M. BAKER, director and vice-president, E. W. Bliss Co.

• **A. J. M. Baker** has been elected director and vice-president of the E. W. Bliss Co., Brooklyn. Mr. Baker was the former general manager of the Crocker-Wheeler Electric Mfg. Co., division of Joshua Hendy Iron Works, Sunnyvale, Cal. Previously he had been deputy director general of the British Purchasing Commission.

• **Harry D. Grow** has been appointed district purchasing agent of the Bethlehem Steel Co.'s Lackawanna plant. He started with the Bethlehem purchasing department in Chicago 10 years ago. Mr. Grow succeeds **Bernard T. Lofft**, who has assumed another post with the company.

• **Lieut. Col. Charles B. Whitehead**, until recently on active duty with the AAF, has been appointed South American representative of the Sterling Engine Co., Buffalo. Col. Whitehead at one time was chief engineering officer of the Peruvian Air Forces.

• **Evelyn S. Carlson** has been appointed sales and production coordinator, Wickwire Spencer Metallurgical Corp., Newark, N. J., subsidiary of the Wickwire Spencer Steel Co.

• **H. W. Brown** has been elected vice-president and general manager, Kelley Mfg. Co., Houston, Tex. **H. L. Slaughter** has been appointed vice-president and assistant general manager, and **L. C. Klump** has become purchasing agent.

• **Leo E. Taylor** has been appointed chief inspector of the Chevrolet Pratt & Whitney aviation engine plant at Buffalo.

W. RUSSELL POOLE, works manager, Corbin Screw Corp.

WILLIAM W. GREENWAY, production engineer, Mt. Vernon Car Mfg. Co. and J. P. Devine Mfg. Co.

CHARLES H. SLAUGHTER, sales manager, Thomas Machine Mfg. Co.

• **W. Russell Poole** has been appointed works manager of the Corbin Screw Corp., New Britain, Conn., joining the corporation after two years with the Barden Corp., Danbury, Conn. Prior to that he was connected with the Norma-Hoffman Bearings Corp. as industrial engineer.

• **E. R. Jacobsen,** New York divisional sales manager for the last 10 years, has been advanced to the newly created position of Eastern division railway sales manager, Gould Storage Battery Corp., Leavenworth, Kan. **W. W. Halsey** has succeeded him as divisional manager in New York.

• **John W. Sands,** who has been with the Conservation Division of WPB at Washington since January, 1942, has resumed his duties with the Development and Research Division of the International Nickel Co., Inc., New York.

• **F. C. Harry Vaughan** has joined the Chicago sales office of Yarnall-Waring Co., Philadelphia.

• **William W. Greenway** has been appointed production engineer for Mt. Vernon Car Mfg. Co. and J. P. Devine Mfg. Co., divisions of H. K. Porter Co., Inc., Pittsburgh. Prior to joining these Porter companies, Mr. Greenway had been associated with Austin Western Co. as production specialist.

• **Ralph Woodward** has joined the staff of B. C. Ames Co., Waltham, Mass., as sales engineer. He has been identified with machine tool manufacture in New England for 20 years and comes to his new position from Norton Co., Worcester, Mass.

• **A. Ward Jenks** has joined Crucible Steel Co. of America, Pittsburgh, as sales manager, Forge Blanks Division. Mr. Jenks will make his headquarters in Detroit.

• **L. J. Henderson** has been made assistant general sales manager, and **Gene P. Robers** sales promotion manager of the Weatherhead Co., Cleveland.

• **Charles H. Slaughter,** machine tool executive and sales engineer, has been named national sales manager for Thomas Machine Mfg. Co., Pittsburgh. Mr. Slaughter began his industrial career as engineer and designer for American Steel & Wire Co., Carnegie-Illinois Steel Corp., and Jones & Laughlin Steel Corp. Before coming with Thomas he served as general sales and dealer relations manager for Liberty Planers, Inc., Hamilton, Ohio.

• **Arthur G. Neubauer** has been promoted to sales manager in charge of jobbing sales for the Mid-West Abrasive Co., Detroit. Before joining the company, four years ago, he was connected with A. C. Spark Plug Co. and McAleer Mfg. Co.

• **Francis D. Bowman** has been appointed director of public relations, The Carborundum Co., Niagara Falls, N. Y. For many years Mr. Bowman has been advertising manager of the company. He will continue to direct the company's advertising in national mediums.

. . . OBITUARY . . .

• **P. E. Martin,** first vice-president of the Ford Motor Co., Detroit, from 1924 until 1941, when illness forced retirement, died recently. A Ford employee since 1904, Mr. Martin was credited with putting Henry Ford's manufacturing ideas into production with conveyor lines and other modern factory practices.

• **Thomas P. Anthony** of Edgewater Park, N. J., died October 7. He was for many years an engineer affiliated with U. S. Pipe & Foundry Co., Burlington, N. J. He was 65 years old.

• **Philip L. Bannan, Sr.** died at his home in San Francisco on October 7. Mr. Bannan was probably the West Coast's pioneer gear manufacturer, having organized the Pacific Gear & Tool Works in San Francisco in the early part of this century.

• **Cecil F. Herington** of the Amsler-Morton Co., Pittsburgh, died suddenly September 30 in Toledo.

• **William M. Bager,** 65, died September 27 in Pass Christian, Miss. Mr. Bager had been vice-president in charge of engineering and sales for the Bucyrus-Erie Co., South Milwaukee, and more recently technical adviser.

• **Daniel J. Lloyd,** 38, head of the cost and production department of Jones & Laughlin Steel Corp., South Side Works, Pittsburgh, died recently. Mr. Lloyd had been with the corporation for 22 years.

Fatigue Cracks . . . BY A. H. DIX

Two Strikes on Louis

• • • We would like to pat our contemporary, *American Metal Market*, on the back for an editorial castigation of Louis Bromfield. As you will recall, Mr. Bromfield is the one who predicted crop shortages of famine proportions in 1944. His latest sin is committed in the current *Reader's Digest*, where he speaks of "mere cast iron."

He left himself wide open and our contemporary brought one up from the floor. We hope that this and his alimentary cropper convince Mr. B. that he is more likely than not to step on a land mine whenever he strays from the literary path he has cleared for himself. Which is, as you know, that of portraying the pleasant stages by which the stern martensite in male and female Nordic constitutions is spheroidized to tropic ductility by the warm sun of India.

Aptronym

The Dugger Tire & Electric Service, Dugger, Ind., has an electrical engineer named H. F. Ohm.

—*Carl G. Hipp, Treas.*
Brown-Fayro Co., Johnstown, Pa.

Soldier Bats .100

. . . I concur in your criticism of Quentin Reynolds' comment concerning the Decalogue—" . . . only 297 words — . . . great reporting." As you say, it is not a report but rather it is a masterpiece of verboten, and recalls the remark of a soldier who gloomily listened to a sermon on the Mosaic laws, but at the conclusion murmured happily to himself, "At least I've never made a graven image."

—*Charles E. Brown,*
Fuller & Smith & Ross, Inc., Cleveland

The virtues of oral and written brevity are greatly exaggerated. People who say little are poor companions, and more often than not their silence is an echo of a mental vacuum. Laconic salesmen have laconic order books. Mail order advertisers find that brief advertisements sell little.

Of course, frugality in the use of words is not measured in lines. Ten-word telegrams may be verbose, and frequently are, owing to the practice of adding deadweight to use up the ten-word minimum. On the other hand, a ten-page article in your favorite family journal may be so economically written that the elimination of even a single word would cause it to bleed.

The size of the subject is the determinant. The new lady swimming sensation, whose name escapes us but whose sculptured 6 ft. 1 in. frame does not, would look foolish crammed into a suit designed for a 90-pounder.

Take a Letter

Although your magazine is circulated through the department in which I work (in Schenectady's best known industry), the issue of June 8 has only recently come to my attention. In it you make the statement, "Moses was not a reporter. He created . . . a code." The following quotations from the Book of Exodus support Quentin Reynolds' use of the term "reporter" in reference to Moses:

And Moses wrote all the words of the Lord . . . and the Lord gave unto Moses . . . two tables of testimony, written with the finger of God . . . And the tables were the work of God and the writing was the writing of God . . . And the Lord said, hew thee two tables of stone like unto the first; and I will write upon these tables the words that were in the first tables, which thou brakest . . . And the Lord said unto Moses, write thou these words . . .

—*D. Edward Brainard,*
1334 Myron St., Schenectady 8, N. Y.

Here Moses functioned as an amanuensis, not as a reporter. As an example of the difference, let Mr. Brainard consider the millions of words emerging from metallurgical mouths this very moment at the technical meetings of the American Society for Metals' annual convention being held this week in Cleveland. A verbatim transcript would be no more appetizing to Mr. B. than an undressed side of beef.

Therefore, your favorite family journal will *report* the sessions. The fat will be trimmed away, the bone discarded, and the red meat served to you and Mr. B.

Routing Slips

• • • We are sorry that Mr. Brainard has not entrusted us with the name of his employer. We hesitate to guess what firm is "Schenectady's best known industry," not wishing to offend the Kutassy's Acetylene-Electric Welding Shop, Star Overall Cleaning Supply Co. (not inc.), Ye Old Copper Kettle Candies, or any other Schenectady industry.

But whichever it is, we recommend the use of routing slips as a means of easing the passage of your favorite family journal from one reader to the next. Some plants prepare their own slips, but Mr. Brainard's employer can get them from us free, neatly printed with company name and list of readers, and gummed on the back in case Schenectady's best known industry hasn't a gluepot to its name.

Stopper

• • • The room without any chairs—*Bristol Brass Corp.*

Low Crossley for Puzzles

• • • Our researches reveal that the most members of this page's loyal army of eighteen readers stop short of the puzzle paragraph. But their distaste for mental effort beyond the line of duty is more than compensated for by the ardor of the puzzle-minded minority, to whom an unsolved problem is as much of a challenge as an unaccompanied redhead is to a sailor.

There are, however, times when a problem arises that may touch the lives of all. As an instance, Henry (Bureau of Reclamation) Shoellhorn cites the postal regulation that Christmas boxes for shipment overseas may not be more than 15 in. long nor more than 36 in. in length and girth combined. Mr. S. wants to know what size box will give the maximum volume.

We find we are not good at solving puzzles, so we stick close to the answer part of our puzzle book, lest our ego be bruised, as it is when we inadvertently tune in the Quiz Kids. But this one seems to be within our range, so we have figured out an answer, to be exposed after the master minds have sent in theirs.

"I" for an "A"

• • • Our apologies to G. P. McCracken for an error that gummed up his contribution to last week's page. He wrote, "*My favorite place name is that lovely village in North Carolina—Amity Hill. But say it fast and the sound belies the meaning.*"

We wrote "Amity Hill" in our manuscript to the printer, but it came out in the paper "Amity Hall," which takes all the sense out of it unless you are trying to imitate a Yorkshireman.

Parlor Profanity

You might like to add to your list of euphonious names that of our milkman, ***Todd Hammet***, who always leaves a Christmas card come Yuletide.

On the days when he ignores our plea for coffee cream, we find a rapid explosive enunciation of his expressive cognomen a "very present help in time of trouble."

—*Ernest C. Roberts,*
Clark Controller Co., Cleveland.

Puzzles

• • • C. R. Cline sent this in:

A farmer has three sons and 150 eggs. He gives the first son 85, the second 50, and the third 15 eggs, and tells them to sell the eggs at a certain price per dozen and at a certain price for each odd egg. All eggs are sold accordingly and each son delivers the same amount of cash to his father. What are the two selling prices?

Northern SUPER-CRANES

MATERIALS HANDLING CAN'T BE SUBCONTRACTED

If a lathe, shaper, milling machine or other tool breaks down you may be in serious difficulty. But work can be subcontracted—ways found to meet the emergency.

But if a crane breaks down, the shop it serves is tied up until repairs are made. Materials Handling is one job that *can't* be subcontracted. You *have* to have reliable cranes for the heavy load of war production.

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1. Rigid one-piece welded steel trolley construction.
2. Transmission type single unit, oil tight gear reduction.
3. Easily removable gear case covers. Splash lubrication of gears.
4. Heavy section girders designed for extreme lateral and vertical loads.
5. Heavy duty roller bearings, turned and ground shafts, press fits on gears, wheels, etc.
6. Standard heavy duty anti-friction bearing crane motors—oversize for severe service.
7. Control equipment built by the outstanding specialists in industrial control.
8. Special heavy duty crane wiring construction to insure safety and eliminate wiring troubles.
9. Unit bridge drive mechanism combined with heavy welded steel end trucks.
10. Hoist and bridge brakes designed for extreme loads and hard service.

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Dear Editor:

TIME STUDY

Sir:

I have read with interest the first two articles of the series by David Anderson and Arthur H. Hansen on the subject of time study in your Aug. 17 and Sept. 28 issues.

Are reprints of this series of articles available?

WILLIAM L. MUNGER, Chief,
Raw Materials Section
War Production Board,
Office of Labor Production,
Washington

Sir:

Congratulations to Messrs. Anderson and Hansen on their excellent article in your Aug. 17 issue. They have certainly put their fingers on one of the most sadly abused phases of time study work and the article is a distinct contribution to the field. Will reprints be made? If so, I am anxious to secure a supply for use in my course, "Advanced Time Study," here at Northeastern University.

WARREN L. GANONG,
Instructor in Industrial Engineering
Northeastern University,
154 Richards Hall,
Boston 15

● The third and concluding installment of the three-part series by Messrs. Anderson and Hansen will appear in this issue. Reprints will then be available of this series and other articles on time study and job analysis.—Ed.

GLUED STEEL

Sir:

Can Redux, an adhesive for joining sheet metal, mentioned in the article beginning on page 60 of your Aug. 24 issue, be purchased in this country? If not is a similar product available?

Also can you tell me where I can get copies of the articles, "Redux Process," in the May, 1943, issue of "Light Metals" and the article, "Joining of Metal," in the February, 1944, issue of "Aircraft Engineering." Both of these articles are mentioned in your Aug. 24 article, "The Strength of Glued Sheet Metal."

ALBERT KURTZON,
Manager
Garcy Lighting Co.,
4224-46 Lincoln Ave.,
Chicago 18

● As far as we know, Redux is not available in this country but several United States manufacturers have developed adhesives for metal. Among them are the U. S. Stoneware Co., Akron, Ohio, and the B. B. Chemical Co., Cambridge, Mass. The John Crerar Technical Library in Chicago has a comprehensive collection of foreign technical journals. Doubtless complete files of the British journals, "Light Metals" and "Aircraft Engineering," are available and the library will no doubt furnish photostats of the wanted articles at cost.—Ed.

METAL POWDER WEIGHING

Sir:

Your articles of June 29 and July 6, "Presses and Processes for Metal Powder Products," by Messrs. Crane and Bureau, include an illustration (page 65, July 6 issue) of a precise weighing arrangement for iron powder, apparently manufactured by the American Electro Metal Corp. and the Syntron Co. Would you be good enough to put us into contact with the company concerned?

Can you tell us also if there are any American books on powder metallurgy?

P. HEALEY,
General Works Manager
Telephone Mfg. Co.,
Hollingsworth Works, Martell Road,
West Dulwich,
London, S. E. 21

● The manufacturer of the weighing equipment is the Exact Weight Scale Co., Inc., 44 E. 23rd St., New York. The electro-magnetic feeder for iron powders is made by the Syntron Co., Homer City, Pa. "Powder Metallurgy" is the title of a book published by Reinhold Publishing Co., 330 W. 42nd St., New York 18, price $3.50. No doubt you are acquainted with "Principles of Powder Metallurgy," by W. D. Jones, published by Edward Arnold Co., London.—Ed.

COLD HEADING

Sir:

In the book, "Bolts, Nuts & Screws," issued by Lamson & Sessions Co., Cleveland, there is an article, "An Appraisal of Cold Heading Practice," by your technical editor, Frank J. Oliver, which we find exceptionally interesting.

One item that we are particularly interested in is the cold heading of commutator segments. Can you tell us if any company is making commutator segments by this method?

S. McDERMOTT,
Assistant Works Manager
Steel Co. of Canada, Ltd.,
Brantford Works,
Brantford, Canada

● The article originally appeared in The Iron Age issue of June 9, 1938. The photograph of commutator segments was based on specimens obtained from the cold heading department of the Ford Motor Co., Dearborn, Mich. Copper stock rolled to a suitable shape was fed into a two-stroke Manville cold header. In the first stroke, the copper strip was split endwise by a blunt tool and in the second blow the wings were bent back to a 90 deg. angle. This formed material for two segments which was cut apart and trimmed to shape in a punch press. The commutator segments were made for electric starter motors for Ford cars and hence were never available as such on the open market. Because of the shift to war work it is doubtful if the operation is any longer performed at River Rouge.—Ed.

PRESSED STEEL STRENGTH

Sir:

I would like to know where best to obtain predetermined facts about the strength of various die stamped products made from stampable sheet steel. In the wood construction line an architect can nearly figure the strength required of a wood constructed truss, bridge, warehouse, etc.

Now in the metal industry, so much newer in years, can the strength of stamped metals be figured reasonably well in advance? Suppose it were decided to make a stake pocket such as used for stake bodies on motor trucks, and the load weight and pressure were pretty well known, could an engineer or metal fabricating firm figure out the right weight or gage of metal that should be used for making this stake pocket?

CLEM ERNST
Sidney, Ohio

● Most of the handbooks, such as "Marks' Mechanical Engineer's Handbook" give formulas for computing the strength of beams but little data are available on special problems such as the stake pocket. Some of the professors that are constantly involved in mathematical computations or stress analysis might be able to help you out. Such a man would be Dr. George Sachs of the Case School of Applied Science, Cleveland. On the other hand, it is our hunch that most of these problems are worked out empirically, for even in the highest stratum of mathematics it is difficult to predict the strengthening that can be obtained on a U-shaped part such as a stake pocket, after the piece is embossed with stiffener ribs. It is likewise difficult or well-nigh impossible to estimate accurately the load that would come on such a stake pocket. This would depend on the shifting of the load on the truck and this factor has so many variables that it would be almost impossible to express the maximum load. The best guide would be to examine what gage of material is being used in truck stake pockets today.—Ed.

WOOD HANDLES FOR CUTLERY

Sir:

We wish to secure a list of wood suppliers who cater to the cutlery manufacturer in supplying wooden blocks for handles for butcher knives, etc. The particular woods we are trying to locate are cocobolo, rose wood, padouk, or any other South American woods used in cutlery. Perhaps you can suggest a wood suppliers' magazine.

LEON A. JOSLIN, JR.,
Manager
C. O. Hudson Cutlery Co.,
Howard City, Mich.

● We suggest you write to the publication, "Wood Products," 431 S. Dearborn St., Chicago.—Ed.

CIO'S 14 POINTS

Sir:

May we have a copy of the condensed statement of the fourteen points demanded by CIO printed by you in an issue several months ago? This I recall appeared on a single page outlining each of the fourteen points asked by labor as basic requirements for new contracts from the steel industry.

PHILIP A. REPINO,
Plant Engineer
Lebanon Steel Foundry,
Lebanon, Pa.

● This appeared on page 103 of our Dec. 9, 1943, issue, a clipping of which is being sent you.—Ed.

7 diameters turned in 1.6 minutes with Monarch Automatic Sizing . . .

Material: SAE 1040
Spindle speed: 900 rpm.
Surface cutting speed: 394 feet per min.
Longitudinal feed: 11.9 in. per min.
Transverse feed: 1.1 in. per min.
Stock diameter: 1¾"
Metal removed: 15.42 cu. in.—4.34 lbs.
Cutting tool: steel turning carbide
Total machining time: 1.6 min.

EXTREMELY fast machining time on this 7-diameter shaft was accomplished by the combination of Monarch Automatic Sizing and Automatic Feed Changes.

The various lengths and diameters are automatically controlled by a thin metal template which governs the length feed through the lead-screw and the cross feed through the feed rod of the lathe. The panel on the pedestal houses the electric controls, and is always placed close to the operator.

The cabinet at the right contains the Automatic Feed Change mechanism. By this device, feed rates are automatically changed according to the varying diameters or varying depths of cut to remove continually the maximum amount of metal on each diameter. The mechanism may be instantly disconnected when constant feeding rates are desired.

Since setup time is relatively low, important time savings are gained even on small runs, magnified, of course, for quantity production. Monarch engineers will gladly give you details of how Automatic Sizing with Automatic Feed Changes may be applied to your present or postwar work.

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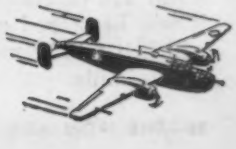


This Industrial Week . .

- **Net Steel Order Volume Down**
- **Ingot Rate Holds Up**
- **Scrap Composite Drops 33c. a Ton**

EVIDENCE was again piling up this week that the steel industry was losing or would soon lose more of its production difficulties such as carryovers, unwieldly backlogs and intense delivery pressure. Coupled with these conditions has been the fairly steady steel ingot production at high levels with a concurrent drop in net order volume.

Although actual steel tonnages booked in the past week have been relatively heavy, some part of this has been nullified by a high rate of cancellations. The latter have stemmed mostly from the drastic curtailment in the landing mat program.

Little difficulty has been experienced in filling gaps in mill schedules which opened up when the landing mat program was all but cut to the bone. The greater part of the cancellations affected advanced schedules but there has been evidence that the steel industry generally will be able to trim its flat rolled carryover substantially by the end of this month and still further by the end of November. Unless a significant reversal in the steel buying trend occurs, steel carryovers should be a thing of the past for most mills by the end of this year.

The steel industry noted this past week that its efforts to solicit new customer business to fill the landing mat cancellation gap received prompt and wholehearted response. This may be taken as an indication that for sheets, at least, steel fabricators are sufficiently certain of the future to drop all pretense of hesitation when the opportunity to secure firm delivery presents itself.

All signs indicate that official Washington looks to further easing in the steel supply-demand relationship. Permission has been granted readily, where refusals were handed out recently, to shift continuous mills from plates to a greater proportion of strip, to roll reinforcing steel from new billets and to provide more steel for civilian supply.

Another industrial note which may foretell coming events is the action of the services in inaugurating a plan for establishing some 50 scrap depots throughout the country to handle a huge flood of termination scrap which is expected in the next two to three months. These depots are not for stock piling purposes but principally to get the scrap out of the manufacturers' plants so that civilian production can get underway.

WHERE the termination settlement is quick and the facilities and materials in a producer's plants are disposed of without any difficulty, scrap will not be shipped to these depots. On the other hand, where terminations and settlements bog down, the scrap will be transported to the supply centers, where it will be stored until an agreement is reached, after which it will be moved through regular scrap channels to the mills.

Although the steel ingot rate has been maintained at peak levels recently, it may begin to level off in the near future with perhaps a few bumps in the curve. Apart from the order situation, which despite heavy cancellations is still far from unhealthy, long delayed repairs are being scheduled more frequently. Although raw steel in the form of ingots and billets may go begging in Pittsburgh and the East, repairs in Mid-Western territory, such as Chicago, have caused the supply of these items to tighten in the past few weeks. On a national scale, with lend-lease demand a negligible factor and with most purchasers for further conversion uninterested, raw steel will be on a much easier basis from now on, which is bound to affect the future steel ingot rate.

An outstanding postwar buyer is expected to be the railroad industry, which in 1945 will probably buy more steel rails than at any time since 1926. Tentative plans forecast purchase of more than 2,900,000 tons of steel rails. Concurrent with this increase there will be a like expansion in the purchase of track accessories. Mindful of the fact that the price for standard rails is now such as to represent an unenviable return to rail producers, some railroads are anxious to get their 1945 orders on the books lest a change be made subsequently in the price of steel rails. Domestic freight carbuilding programs for 1945 and beyond are said to be substantial enough to keep carbuilding shops operating at capacity for some time. The ODT has set up 705 passenger cars for construction in the second, third and fourth quarters of 1945. So far, 55 passenger cars have been released for construction by American Car & Foundry for May to August delivery next year. If any of these programs should interfere with the substantial 1945 Army railroad car program, they will have to give way.

WITH one exception this week, scrap markets were still reflecting a waiting attitude. Heavy melting steel at Chicago declined $1 a ton, thus bringing THE IRON AGE composite down 33c. a gross ton to $15.75 a gross ton. The next few weeks or so should definitely establish whether or not scrap will continue downward or strengthen considerably. Scattered evidence this week tended to support a strengthened market viewpoint.

Steel ingot operations rose half a point this week to 96 per cent of rated capacity. District gains contributing to this national rise were: Chicago, up three points to 98.5; Youngstown, up three to 96; Buffalo, up two and a half to 102, and the Western District, up five and a half to 94.5. Declines occurred in Pittsburgh, down half a point to 93.5; Wheeling, down one-half to 91.5; Detroit, down two to 95.5; Cincinnati, down 11 to 98, and the Eastern District, down eight to 97 per cent.

• **PIPELINE**—Construction of a 1000-mile nautral gas pipeline from Texas to California is planned by the Pacific Gas & Electric Co. According to a registration statement filed with the Securities & Exchange Commission, the 60 million dollar pipeline will make Texas gas available both in southern and northern California and is part of a 115 million dollar refunding program. Application to begin construction in 1945 has been made to the War Production Board.

• **MAGNESIUM PROSPECTS**—Removal of restrictions on the use of magnesium for civilian products has spurred interest in secondary ingot, smelters report. Just getting a foothold commercially, impetus from revocation of preference rating Order M-2-B, and issuance of Order M-2-C will help the secondary ingot considerably, it is believed. Toy manufacturers, casting about for a steel substitute following a virtually complete turndown on their request for permission to use that metal, are said to be looking with particular favor upon magnesium. The volume of free publicity which has accompanied the war career of the featherweight metal will go far to overcoming any price detriment for toys and other less essential civilian products. No price resistance has been felt by the smelters in marketing ingot, they declare.

• **EXTRA KP DUTY**—A War Department statement says that installations under the New Orleans Port of Embarkation flattened out 1,001,750 lb. of tin cans for salvage the past year with assembly line methods. Mess halls must wash, remove labels and take tops off every can used there and send them to the salvage storage area. A crew of seven men continues the process at the rate of 2800 lb. daily shipped to a detinning plant.

• **WHAT SPEED RECONVERSION**—Aluminum and zinc trim for interior walls and floors has hit the counters of retail stores in some of the larger cities. Authority to use aluminum for this purpose was given 90 days ago which means that time required to get it on the market was just about as calculated. The zinc, however, presumably went into fabrication after modification of WPB Order M-11-B on Sept. 9, a possible indication that reconversion is getting swifter. In these particular items, both metals will have to displace colorful, non-staining plastics which have gained a firm foothold.

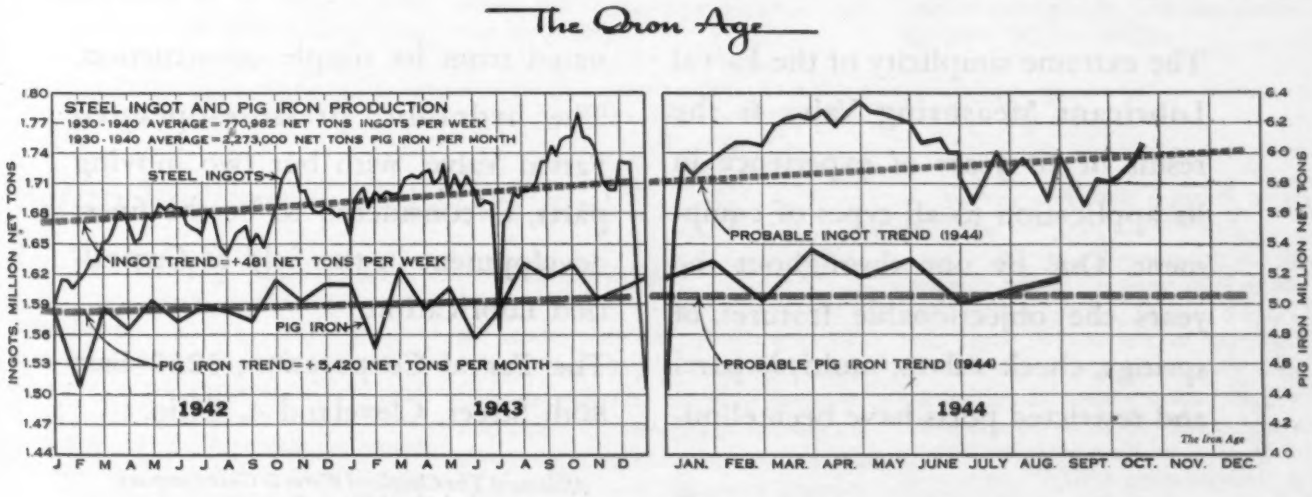
• **EX-WAR BABY**—Announcement by the Bureau of Mines that seven Far Western Mercury Mines produced 87 per cent of the August output means that settling prices effectively have cleared the production slate of the swarm of marginal producers which burrowed into the market at the outset of the war. Loss of Italian production and threatened loss of Spanish production to the Axis then sent prices up to over $200 per flask until OPA set a $191 f.o.b. West Coast ceiling early in 1942. The price today, approximately $100, finds only a few old faithful mines, like the New Idria and New Almaden, which have been in production over 100 years, and the Abbott, Mt. Jackson, Reed, Cordero and Bonanza able to stand the gaff.

• **PLUMBING AND HEATING EQUIPMENT**—The supplemental allotment of 58,428 tons of steel for civilian use in the fourth quarter will go into the production of plumbing and heating equipment. Products to be made are: Domestic cooking and heating stoves; warm air furnaces; oil and gas floor and wall furnaces; warm air distribution equipment; underfired gas water heaters; hot water storage tanks; range boilers; low pressure steam and hot water heating specialties; and combustion, heat generation and distribution controls. Manufacturers of any of this equipment were told that they must file supplemental CMP 4B applications with the WPB Plumbing and Heating Division. With each request for additional material, a manufacturer must submit Form WPB-3820, giving all necessary information as to his labor supply for the requested increase.

• **LICENSE PLATES**—WPB has revoked its restrictions on production of all kinds of metal license plates issued by state or other local governments. Because the supply of steel has become considerably freer in recent months, continued control over production of metal license plates, which use mostly steel, was considered unnecessary.

• **AWARD**—American Bridge Co. has been awarded a 1200-ton contract amounting to $231,753 for a 51-mile steel tower line for the Bonneville-Coulee Power Administration, in eastern Washington.

• **MORE PIPE**—Previously denied to it because of wartime stringency, WPB has granted the Petroleum Administration for War 20,000 tons of oil country tubular goods for fourth quarter use. In making the announcement that this steel tonnage had been restored to PAW, Deputy Administrator Ralph K. Davies said that WPB had first considered that inventories were excessive but that when a survey revealed the vital need for steel the claim was allowed in full.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
October 10	94.0	95.5	93.0	98.5	98.0	99.5	91.5	94.0	97.5*	89.0	109.0	92.5	105.0	95.5
October 17	93.5	98.5	96.0	98.5	98.0	102.0	91.0	94.0	95.5	94.5	98.0	92.5	97.0	96.0

* Revised

Farval alone gives you all of these vital features:

contains no springs	has but two moving parts
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measures by piston displacement	with a tell-tale indicator at every bearing

The extreme simplicity of the Farval Lubricant Measuring Valve is the result of 18 years of experience in its application to all types of equipment. One by one throughout the years the objectionable features of springs, check valves, multiple parts and restricted ports have been eliminated from its simple construction.

The hydraulic, pressure-operated Farval Valve, with but two moving parts, is considered to be the finest development in the field of Centralized Lubrication.

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There are more Farval Systems installed on steel mill equipment than all other makes combined

British Auto Reconversion Ready To Start One Week after Green Light

By JOHN H. VAN DEVENTER

London (by cable)

• • • **Reconversion of the British** automobile industry will require a much shorter time than the changeover in the states.

One week after the go ahead signal is given by the government, Austin Co. expects to have chassis coming off its line at the rate of 400 per week, according to Managing Director Lord, one of the ablest British production executives. Within three months, the production rate of this company will be 1600 per week. The postwar model will be a modified 1939 product.

This is a rather surprising expectation since this company, largest volume producers in Great Britain, has been devoting its effort and equipment primarily to the production of Lancaster bombers, tank transmissions and other products quite dissimilar to its usual line.

While domestic demand in the United Kingdom is expected to be good for several years, export expectations are not so bright because of the cost level. American light cars can be set down in foreign ports, freight paid, at a price less than material and labor costs of British makers. Principal reason for this is not a matter of labor or machine efficiency, but of volume.

British total car output is approximately one tenth that of America, and few of our larger units could operate and break even on a 500,000 car output, which is equivalent to the entire British automotive volume.

Aircraft production in the United Kingdom is expected to shrink 90 per cent after the cessation of hostilities, with the shadow plants erected and equipped by government but managed by private industrial concerns closing first. Plans have not yet been disclosed regarding disposal of these government-owned properties.

Services to Set Up Scrap Storage Depots Pending Contract Settlements

Pittsburgh

• • • **In preparation for** heavy cancellations of war contracts within the next 60 to 90 days, the various service commands are setting up a substantial number of scrap storage depots throughout the country. These depots, estimated to be nearly 50 in number, will take the scrap out of war plants where litigation on the termination of contracts holds up the settlement of such contracts and consequently holds up reconversion to peacetime production.

The storage depots are in no manner a stockpiling procedure, but have been clearly defined as a holding place for scrap pending settlement of war contracts. The expected cancellation program that will soon go into effect, while cutting down considerably the production scrap that will move into dealers' yards will substantially increase the termination material that will be scrapped.

The first across the board type of cancellation of contracts that are affected by the services will more clearly point the way to the manner in which such scrap, as has accrued from war industries and is owned by the government, will be handled.

It is believed that the price of this scrap will not be too much of a factor with the government, but the emphasis will be placed on its disposal through normal scrap channels, namely, the dealer. If moved into the scrap depots by the government, added costs to the scrap make it more expensive than if handled immediately from the producing plant by the dealer.

Scrap Institute Chief Asks Aid In Securing Controls Abandonment

Pittsburgh

• • • **Speaking before the Pittsburgh** Chapter of the Institute of Iron and Steel Scrap, Inc., Edwin C. Barringer, president of the organization, urged dealers, brokers, and yard operators to aid in every manner possible in the abandonment of government controls over the scrap industry. He pointed out that, while there was considerable resistance to government regulation by the industry in 1941 when this country was going into the war, the industry now appears to depend upon the government as a crutch to aid.

Since the scrap industry is currently undergoing its postwar reconversion pains, Mr. Barringer pointed out that it is in an enviable position and will be back on a peacetime business basis long before most other industries. The difficulties that the industry is undergoing now, both from the standpoints of volume of business and price, are far less drastic than what might be encountered if price and sales volume held up to the last day of the war and then dropped to ridiculously low levels over night.

However, the independence of the members of the industry is of prime importance in getting back to a peacetime level, Mr. Barringer said, and the industry should aid in every manner possible in getting restrictive government controls lifted. The industry, as a whole, is believed to be in favor of keeping the OPA price schedule as it now stands until it is possible to drop it entirely. Apparently, there has been some effort to start eliminating the schedule in a piece-meal fashion, but because of the complications such a procedure would cause, industry members want the whole schedule abandoned simultaneously.

OCR Granted Supplemental Allotment of 58,428 Tons of Steel

Washington

• • • **Bringing the overall** allotment to 278,203 tons for the fourth quarter, the WPB Requirements Committee last week made a supplemental allotment of 58,428 tons of steel to OCR. The overall allotment does not represent the total amount of steel used in civilian production.

Many regular civilian production programs, it was pointed out, are conducted on behalf of OCR by the Office of the Operations Vice-Chairman, which acts as a claimant in behalf of the various industry divisions, and by other claimant agencies. In addition 200,000 tons of steel has been made available for the "spot authorization" program under which preference will be given to manufacturers intending to produce items on OCR's list of essential products. Total civilian allotments for the fourth quarter aggregate 453,428 tons of steel.

OCR divided the 58,428-ton allotment into three parts: (1) 9000 tons for direct allotment to restore cuts in regular fourth-quarter and including minor program increases; (2) 19,428 tons of carbon steel for minor increases in programs for the use of which changes will be required; and (3) 30,000 tons of carbon steel to be put in a special reserve for certain so-called major programs.

Production of Open Hearth, Bessemer and Electric Steel Ingots and Steel for Castings

Based on Reports by Companies which in 1943 made 98.3 Per Cent of the Open Hearth, 100 Per Cent of the Bessemer and 87.9 Per Cent of the Electric Ingot and Steel for Castings Production.

1944

Period	Estimated Production—All Companies: Open Hearth Net Tons*	Open Hearth Per Cent* of Capacity	Bessemer Net Tons*	Bessemer Per Cent of Capacity	Electric Net Tons*	Electric Per Cent* of Capacity	Total Net Tons*	Total Per Cent* of Capacity	Calculated* Weekly Production all Companies (Net Tons)	Number of Weeks in Month
January	6,769,438	97.2	439,551	85.4	377,751	83.3	7,586,740	95.6	1,712,582	4.43
February	6,410,338	98.5	409,781	85.2	368,555	87.0	7,188,674	96.9	1,736,395	4.14
March	6,976,450	100.1	455,368	88.5	388,408	85.7	7,820,226	98.5	1,765,288	4.43
1st Quarter	20,156,226	98.6	1,304,700	86.4	1,134,714	85.3	22,595,640	97.0	1,738,126	13.00
April	6,768,895	100.3	437,517	87.8	362,118	82.5	7,568,530	98.5	1,764,226	4.29
May	6,860,532	98.5	438,980	85.3	380,960	84.0	7,680,472	96.8	1,733,741	4.43
June	6,452,087	95.6	418,117	83.9	347,028	79.0	7,217,232	93.9	1,682,338	4.29
2nd Quarter	20,081,514	98.1	1,294,614	85.6	1,090,106	81.9	22,466,234	96.4	1,726,844	13.01
1st 6 months	40,237,740	98.4	2,599,314	86.0	2,224,820	83.6	45,061,874	96.7	1,732,483	26.01
July	6,723,994	96.7	415,593	80.9	334,710	74.0	7,474,297	94.4	1,691,017	4.42
August	6,691,262	96.0	429,637	83.5	348,901	77.0	7,469,800	94.1	1,686,185	4.43
September	6,464,631	95.6	398,028	80.0	330,837	75.2	7,193,496	93.4	1,680,723	4.28
3rd Quarter	19,879,887	95.8	1,243,258	81.5	1,014,448	75.2	22,137,593	93.7	1,686,031	13.13
9 months	60,117,627	97.5	3,842,572	84.5	3,239,268	80.8	67,199,467	95.7	1,716,900	39.14

Note—The percentages of capacity operated are calculated on weekly capacities of 1,572,755 net tons open hearth, 116,182 net tons Bessemer and 102,350 net tons electric ingots and steel for castings, total 1,791,287 net tons; based on annual capacities as of Jan. 1, 1944, as follows: Open hearth 82,223,610 net tons, Bessemer 6,074,000 net tons, Electric 5,350,880 net tons.

* Revised January through March, 1944.

1943

Period	Estimated Production—All Companies: Open Hearth Net Tons*	Open Hearth Per Cent* of Capacity	Bessemer Net Tons*	Bessemer Per Cent* of Capacity	Electric Net Tons*	Electric Per Cent* of Capacity	Total Net Tons*	Total Per Cent* of Capacity	Calculated* Weekly Production all Companies (Net Tons)	Number of Weeks in Month
January	6,576,788	97.8	478,161	85.9	369,573	95.5	7,424,522	96.8	1,675,964	4.43
February	6,031,605	99.3	447,810	89.1	345,189	98.8	6,824,604	98.5	1,706,151	4.00
March	6,787,902	100.9	503,565	90.4	383,111	99.0	7,674,578	100.0	1,732,410	4.43
1st Quarter	19,396,295	99.3	1,429,536	88.4	1,097,873	97.7	21,923,704	98.4	1,704,798	12.86
April	6,510,824	99.9	482,478	89.5	380,401	101.5	7,373,703	99.3	1,718,812	4.29
May	6,669,703	99.1	482,424	86.6	397,564	102.7	7,549,691	98.4	1,704,219	4.43
June	6,202,889	95.2	453,663	84.1	382,801	102.1	7,039,353	94.8	1,640,875	4.29
2nd Quarter	19,383,416	98.1	1,418,565	86.8	1,160,766	102.1	21,962,747	97.5	1,688,144	13.01
1st 6 months	38,779,711	98.7	2,848,101	87.6	2,258,639	99.9	43,886,451	98.0	1,696,423	25.87
July	6,556,794	96.8	466,345	90.6	384,737	91.9	7,407,876	96.2	1,675,990	4.42
August	6,700,118	98.7	484,847	94.0	401,499	95.7	7,586,464	98.3	1,712,520	4.43
September	6,646,968	101.4	480,757	96.4	386,614	95.4	7,514,339	100.7	1,755,687	4.28
3rd Quarter	19,903,880	99.0	1,431,949	93.6	1,172,850	94.4	22,508,679	98.4	1,714,294	13.13
9 months	58,683,591	98.8	4,280,050	89.5	3,431,489	98.0	66,395,130	98.1	1,702,439	39.00
October	6,892,029	101.6	513,585	99.5	408,503	97.4	7,814,117	101.2	1,763,909	4.43
November	6,543,204	99.6	440,878	88.2	387,893	95.5	7,371,975	98.6	1,718,409	4.29
December	6,502,980	96.0	390,979	75.9	361,185	86.3	7,255,144	94.2	1,641,435	4.42
4th Quarter	19,938,213	99.1	1,345,442	87.9	1,157,581	93.1	22,441,236	98.0	1,707,857	13.14
2nd 6 months	39,842,093	99.0	2,777,391	90.8	2,330,431	93.7	44,949,915	98.2	1,711,074	26.27
Total	78,621,804	98.9	5,625,492	89.1	4,589,070	96.7	88,836,366	98.1	1,703,804	52.14

Note—The percentages of capacity operated in the first 6 months are calculated on weekly capacities of 1,518,621 net tons open hearth, 125,681 net tons Bessemer and 87,360 net tons electric ingots and steel for castings, total 1,731,662 net tons; based on annual capacities as of January 1, 1943, as follows: Open hearth 79,180,880 net tons, Bessemer 6,553,000 net tons, electric 4,554,980 net tons. Beginning July 1, 1943, the percentages of capacity operated are calculated on weekly capacities of 1,531,789 net tons open hearth, 116,494 net tons Bessemer and 94,667 net tons electric ingots and steel for castings, total 1,742,950 net tons; based on annual capacities as follows: Open hearth 79,867,450 net tons, Bessemer 6,074,000 net tons, Electric 4,935,960 net tons.

* Revised January through December, 1943.

Award Quiets Layoff Rumor at Plane Plant

Cleveland

• • • **A new and enlarged contract** for wing assemblies for the B-29 Superfortress was awarded recently to the Fisher Aircraft Plant No. 2 by the Army Air Service Technical Command, thus quieting rumors of an 8000 worker lay off at the plant after a contract cutback last week resulted in the dismissal of 2400.

While the exact nature of the contract has not yet been made known, it was stated that it would be large enough to assure employment of all the remaining workers at the plant.

Rumors that a fighter plane would be produced at the plant to replace the P-75 that was on the factory's program were dispelled by Air Corps officials. The fighter planes already in production, which are of an experimental type, will be completed, but that is all.

About 50 per cent of those workers that were dismissed last week have already been transferred to high priority war jobs by the United States Employment Service, it was reported, and the remainder are rapidly being signed up for other war jobs.

Transfer NE Steel Activities

Washington

• • • **Upon the dissolution** on Nov. 2 of the WPB Conservation Division, the NE steel specification activities will be transferred to the Steel Division, with Edwin Joyce as administrator to review these specifications in view of changing conditions, it has been announced by Harold Coonley, Director of the Conservation Division. Several committees which operated in the division to channel cadmium and tin into the most essential end uses will be continued.

WPB Amends Regulation 24 Controlling Machines and Equipment

Washington

• • • **WPB has announced** an amendment to Priorities Regulation 24 eliminating the necessity for board authorization to place unrated purchase orders for machinery and equipment covered by List A of the regulation. WPB also tightened the policy regarding the assignment of preference ratings on purchase orders needed for resumption or expansion of civilian production. At the same time General Preference Order E-1-B, which regulates the production and distribution of machine tools, was amended to eliminate the necessity for ratings on purchase orders and permit unrated orders to share in the percentage of production that is set aside for non-military production.

Warning was given to purchasers not to file applications for priorities assistance on orders for equipment needed for reconversion unless a case of great hardship can be established. All other applications, WPB said, will be denied.

To date purchase orders for reconversion equipment have been largely confined to orders for machine tools it was pointed out. Under E-1-B, non-military purchasers are guaranteed at least 25 per cent of machine tool production. Many machine tool builders are now in a position to devote more than 25 per cent of their capacity to such orders.

While rated non-military, purchase orders will still be delivered ahead of unrated orders, WPB representatives stressed the fact that from now on a minimum of ratings will be assigned to non-military orders for machine tools. Both rated and unrated orders for machine tools under E-1-B will not enjoy the same measure of protection when within 60 days of delivery, WPB said.

Metal Working Machinery Sales Bring 79 Per Cent of Cost

Washington

• • • **Metal working machinery** disposed of by the RFC in August brought $8,554,000 or 79 per cent of cost, says a report by W. L. Clayton, Surplus War Property Administrator. Dispositions of surplus war property by five disposal agencies amounted to $27,815,000, an increase of $11,360,000 over July. The bulk of the August dispositions were made by RFC, $17,954,000 and the Treasury Procurement Division, $9,068,000.

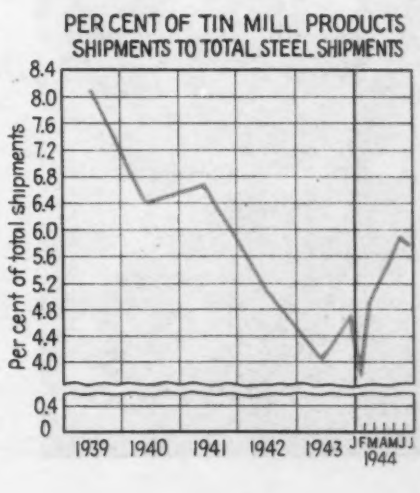
Inventories of metal working machinery on Aug. 31 amounted to $17,152,000 while acquisitions during the month totaled $16,333,000. Disposals amounted to 40 per cent of the available property. This group includes machine tools, other production items and machine parts. Mr. Clayton said that the high rate of disposal reflects the fact that most surplus machine tools are owned by and installed in DPC facilities and can readily be assigned to other plants still engaged in war work.

Inventories of the disposal agencies increased $115,000,000 during August, and at the end of the month amounted to $348,000,000. During August, approximately $143,000,000 in surplus property was turned over to the disposal agencies, an increase of $44,000,000 over declarations in July. The War Department declared property valued at $130,000,000, the major items being aircraft, tires and automotive parts, construction equipment, steel, drums and hardware.

The owning agencies are now screening about $691,000,000 worth of property to determine how much of it can be declared as surplus. Of this amount, $397,000,000 is War Department property and $244,000,000 is DPC property. If only a substantial portion of this property is subsequently made available to the disposal agencies, the total declarations of surplus property will then be in the neighborhood of $1,000,000,000.

While $27,815,000 represents the total surplus war property moved by the disposal agencies in August, the War Department also disposed of approximately $17,000,000 of inventories in terminated contracts and $11,000,000 in sales of salvage, scrap and other disposals. This means that the Government actually sold a total of more than $56,000,000 of war materials in August. Substantial other disposals were made direct by other owning agencies, such as the Navy Department, War Food Administration and Maritime Commission. In addition, the War Department redistributed $21,000,000 of surplus war property within its own services and transferred property costing $7,000,000 to the Navy, both without reference to a disposal agency.

REGAINING GROUND: *In 1939 total tin mill product shipments accounted for 8.1 per cent of total steel shipments. By 1943 this participation had dropped 50 per cent to 4 per cent of total steel shipments due to restricted measures taken by WPB because of the war. During the first seven months of this year, the participation of tin mill products to total steel shipments has been on the up grade. In June, July and August of this year, close to six per cent of total steel shipments were composed of tin mill products. With an easier steel situation and with restrictions being removed 1945 should reflect a further increase in the participation of tin mill products to total steel shipments.*



WPB Revokes Order E-5-A

Washington

• • • **Because production** of gages and precision measuring hand tools is now considered adequate for all essential demand, suppliers may purchase these items without ratings, WPB has announced. For these goods, the use of WPB Form 547 has been discontinued. Order E-5-A which required that manufacturers of gages and precision measuring hand tools restrict shipments to rated orders, has been revoked. Supply is now large enough to make normal purchasing possible; therefore, manufacturers need no longer set aside a percentage of production for jobbers and dealers, WPB said.

WLB Non-Recommendation Rule May Be Fuse That Sets Off Strikes

Pittsburgh

• • • **The action** of the WLB in passing its troubles on the wage question to President Roosevelt without recommendations may be the fuse soon to be lighted and followed by various strike explosions on the steel labor front.

Only by his own personality and pleading, was Phil Murray able to keep the CIO from reneging on its no-strike pledge a few months ago. With labor interpreting the latest WLB ruling as a victory for management (and the record shows that it was) there will be no wholehearted disposition to hold the rank and file in check according to sound management and labor opinion here.

Murray in some recent statements has inferred that if the final ruling goes against the union he may not be able to check strikes on the part of steelworkers. What he may mean is that he may not be able to check (or want to check) widespread and large walkouts. The international office of the USWA has never had much success in stopping outlaw strikes. Furthermore the "spontaneous" widespread strike late last year may be the pattern to be used if the resentment of the steel workers boils to the proper pitch.

More important and possibly a sign of the future trend in this wage case, which also extends even to the probable future of Phil Murray in the steel union movement as well as the entire CIO, may be a flood of small but troublesome outlaw strikes on a grand style. In the past they have become more frequent during the period when a decision was in the making. It is now up to the President to make the next move. Pressure strikes although not admitted as such may be expected according to opinion here.

A decision of the WLB in the form of shift differential and a few other face-saving devices for both sides will not, according to steel opinion here, be enough to take Phil Murray off the spot before the union rank and file. Murray must do as well as John L. Lewis in any fight for more wages and probably nothing but an actual increase in the steel wage base rate will satisfy Murray or help him to keep the confidence of his following which he has tenaciously held for years.

From the steel management standpoint, the WLB handling of the case by sending it to the President without recommendation is a complete victory for them. The steel industry has consistently held that the WLB had no right to consider even the demand for an increase in the base rate of steel wages, holding that this was a job for Congress. However the forthright manner in which the steel industry through its research committee, its public relation output and its "tail twisting" method of getting its side to the WLB and the public, probably had much to do with the WLB action. In past years the industry has never been so coherent in voicing its own side of the matter except in a lukewarm manner to the press and the public.

According to reliable speculation here any attempt to give the union a "bone" to chew on with about 8c. an hr. derived from face-saving mathematical gyrations will not by any means end the steel wage case. If it should, observers here who have been following the various side issues feel that the CIO and USWA leadership will be under tremendous pressure to show "what they can do or else."

HANDICAPPED WORKERS: *Aircraft work on self-sealing fuel tanks is a full time occupation for these handicapped persons. They are on the job at Ranco Los Amigos near Los Angeles, where they were formerly county wards.*

Emptying of War Plants Held Key to Reconversion

Washington

• • • **Successful reconversion** is assured if emptying of war plants for civilian production will do the job.

This was made apparent by the prediction of WPB Chairman J. A. Krug recently that six months after X-Day expenditures for munitions and war construction will have sunk to the rate of $37,000,000,000 annually. This means that it is planned to cut 55 per cent of annual war expenses.

Only 40 per cent was originally slated to be trimmed from the current yearly spending rate of $67,000,000,000, but the government will still be spending more than $61,000,000,000 to ease the transition from war to peace.

As now planned, the firm cuts scheduled by the Armed Services for the first year after X-Day are as follows: 24 per cent in the first quarter; 8 per cent in the second quarter, and 4 per cent each in the last two quarters. Mr. Krug's expectations are that this schedule will be revised to knock out 55 per cent instead of 32 per cent in the first six months after Germany is defeated.

Pittsburgh Opinion Takes Issue With Some Washington Wage Views

Pittsburgh

• • • **The arguments based on cost of** living in the attempt to obtain a wage increase in the steel industry apparently are being substituted by an entirely different tack. The new tack is one that is based on adjustments in work schedules and base pay when victory occurs in Europe.

Toward the conclusion of the Steel Case and timed as to make it practically impossible for the industry to present any substantial data to the War Labor Board, the chairman of the board made certain statements about the adjustments in industry that would be necessary on V-E Day. This approach appears sound and it is one that will be heard in greater length and detail in the near future.

Certain Washington officials are apparently advocating an adjustment to take place on V-E Day that will maintain the hourly earnings (the take-home pay) of the worker. This is to be accompanied by an adjustment in the base rates to compensate for the return to a 40-hr. work week.

The base rate in steel for labor is currently 78c. per hr., based on a 40-hr. week. However, the industry is working on a 48-hr. week, so that the worker actually receives, with his extra pay, approximately 85c. per hr. worked.

With the prospects of a 40 per cent cutback on V-E Day, the 48-hr. week will be unnecessary except in a few industries, such as munitions, radar, aircraft, etc. When the steel industry drops to the 40-hr. week, the overtime earnings will disappear and the worker will again be working on the basis of 78c. per hr., taking a cut in hours and premium rate.

Labor costs of steel producers are now predicated on labor costs of 85c. per hr., which is actually being paid. Therefore, if the industry were to get the benefit of a savings of 7c. per hr., it is alleged by these Washington officials that profits will be vastly increased at the expense of the employee. Since the industry has been making money during the war years, equity demands that present wage rates be increased so that the workers will receive the same amount per hour worked.

While these arguments sound logical, they have some major faults, according to opinion here, and are believed inherently unsound. They are predicated on the assumption that current labor costs of industry can and should be maintained for the workers and that industry will be able to make as much money as it has during the war. This would appear to rule out any possibilities of compensating price increases.

Actually, however, steel producers' return on investment have not been large, about 2 to 4 per cent. The money made has been on certain special items such as armor plate, shells, bombs, bullet core wire, and other such products. The profit on them has enabled the producer to show an overall profit, while losing on large tonnages of such items as steel plate and hot rolled bars. When these "sweetener" products are cut off on V-E Day, steel producers will be back in the competitive field with a price structure geared to 1939 prices, a considerably expanded tonnage of steel available, and labor costs based on something around 85c. per hr. (assuming such an adjustment described has been made), far in excess of what they were in 1939.

For the steel industry to take up this fight and point out that it has been living on its war business is a suject full of dynamite. Each company is renegotiated on these items, but should any company come out with the bald statement that it has been making sufficient money on such products to keep out of the red, there would be an immediate cry of "profiteering on war goods." Renegotiation undoubtedly eliminates profiteering, but any company would be castigated by labor and the government together. So the handcuffs are on pretty tight, and every company is fearful for its own position.

Output Enters Selective Stage at Cleveland Plants

Cleveland

• • • **Production of war materials** in this area appears to be entering the selective stage, according to the Chamber of Commerce monthly employment survey. While the 100 company employment total dropped from 121,020 at the end of August to 119,543 as of Sept. 27, the loss of 1.2 per cent was in line with the slowly declining trend of the past 15 months.

STRIP TRIMMER: *A worker inspects steel strip coming off the rollers at 2000 ft. per min. at an Eastern steel mill. Three Westinghouse motors, of 40 hp., 100 hp., and 150 hp., provide the power for the operation. Roller located directly in front of the reel relieves tension.*

ALASKA WAY: *Two 1000-hp. Alco-G.E. diesel locomotives operating in tandem, speed war supplies to the interior of Alaska on the new route of the Alaska Railroad between Whittier and Anchorage. The route, 1234 miles long, contains the sixth longest tunnel on the North American continent.*

INDUSTRY

Railroads Preparing for Peak Postwar Rail Purchases

By C. T. POST

Chicago

• • • **Domestic railroads tentatively** plan to ask the Office of Defense Transportation to request an allotment of 2,907,000 tons of rail for 1945, compared to the 1,900,000 tons actually authorized for the 1944 revised program.

The final amount requested by the railroads depends, of course, on the way their revenue picture shapes up and the availability of track labor. If the 2,907,000 request is handed in, and war conditions permit, it is speculated that the amount actually received will be in the neighborhood of 2,300,000 tons. The latter amount represents controlled cooling capacity of the mills. The original 1944 rail allocation started at 550,000 tons per quarter, but was cut to 399,800 tons in the third quarter and 429,000 tons in the fourth quarter because of conflict with the stepped up shell steel program. Unless the fuse is removed from the 1945 shell steel program as now contemplated, it, too, may prove explosive to next year's rail request.

Rail production has not been in this neighborhood since the twenties and, forgetting exports, a 2,300,000-ton year would be the largest since 1926, when 3,603,767 net tons were produced. Controlled cooling was not introduced until the early thirties. Taking export prospects into consideration, the four domestic rail producers, if given a free hand, doubtless will top this figure considerably. In 1936, production both for domestic railroads and export was 1,366,228 net tons; in 1937, 1,619,228 net tons; in 1938, 697,642 net tons; in 1939, 1,312,647 net tons; in 1940, 1,678,986 net tons; in 1941, 1,927,852 net tons; in 1942, 2,096,160 net tons, and in 1943, 2,126,996 net tons.

The railroads have a twofold interest in making next year a banner year. Maintenance work, long delayed because of lack of labor and other war conditions, cannot be delayed much longer. Moreover, the taxation picture makes it desirable to undertake heavy maintenance programs when operating revenues are high. In the longer post war pull, those roads which intend to compete with the airlines for high speed passenger travel must necessarily rapidly commit themselves to a broad program of track and rolling stock improvement.

The latter factors are interpreted by steel producers to mean a period of good rail business for some years after the war. Speculation centers on domestic rail requirements of from 2,200,000 to 2,500,000 for from two to four or five years after the war, with subsidence to a level of 1,750,000 tons after that.

Placing of heavy tonnage in 1945 may be good business for the railroads from a price standpoint too. It is no secret that the frozen price of $40 per gross ton has not yielded a handsome profit to the three heavy rail producers selling on that basis, United States Steel, Bethlehem, and Inland, nor has the special $45 price allowed Colorado Fuel & Iron put them into plush. If any adjustment is made in steel prices, as a result of wage increases or otherwise, rails are a good bet to be one of the items affected.

This unfavorable price situation may militate against post-war entrance of two far western mills, Kaiser and Geneva, into rail production, although Kaiser particularly throws sufficient business to certain railroads to repay nice tonnage through reciprocal buying.

During the last half of 1944 allocations for track accessories have been kept by WPB close to 53 per cent of rail tonnages allocated, and on this basis should be slightly less than 1,500,000 tons if 2,907,000 tons of rail are granted. During recent months, tie plate manufacturers note a considerable swing toward wider, heavier plates which, some believe, will become standard on principal lines using 112 lb. and 131 lb. rail. The new 14-in. plates, in which principal interest to date has been shown by the Milwaukee and Santa Fe roads, currently are replacing 12 and 13-in. plates on the high speed lines. From the steel producers' standpoint, this means a plate weighing from 19 to 22 lb. instead of 13 or 14 lb. Thus, tie plate business, instead of being about 25 per cent of rail tonnage, may amount to about 32 per cent.

Currently, tie plate deliveries are tight, principally because Youngstown Sheet & Tube's production directive calls for its capacity to be used in other ways and because of the

closing several months ago of Sheffield Steel Corp.'s St. Louis works. This leaves the four rail producers and Jones & Laughlin, Republic, the Steel Corp., Wheeling Steel and Weirton the principal producers in the field. Again we have an unfavorable item pricewise, as demonstrated by Sheffield's leaving the field despite OPA price concessions.

The same factors which point to a heavy 1945 rail program augur substantial orders for the car builders.

Freight car production this year will top the 1943 production of approximately 68,700 compensated units but several factors, principally lack of labor, may prevent completion of the once scheduled 85,500 compensated units. "Compensated units" are used as a production measurement equivalent to a full sized standard freight car, because Army rolling stock usually is somewhat smaller). Next year's production may proceed without production scheduling by WPB, it is believed, if the steel and labor situations improve.

Currently, car builders are understood to have about 45,000 cars open capacity for the second, third and fourth quarters of 1945.

The 1945 Army car program currently is hovering in the neighborhood of 21,460 cars of various types, with production of all of them scheduled by July.

The biggest car export program in years, headed, of course, by the proposed 74,500 cars for France, is in the wind, and the potential total is in the neighborhood of 115,000 cars. Nearly all of this export business, however, is still in the formative stages, and may come to fruition in greatly modified form. Finance is not the least important factor.

The French program, it is understood, may be financed through the UNRRA. Delivery would be between July 1, 1945 and July 1, 1946. This agency also may handle 17,200 cars for India, and 5000 cars for Belgium. The Russian Purchasing Commission tentatively has feelers out for 10,000 56-ton flat cars and 2000 50-ton air dump cars. The good neighbor policy, expressed by export-import bank financing, may account for 5000 cars for South America, 1000 for Cuba and 1000 for the Mexican National Railways. State Department approval is involved in all cases, and the FEA also will have a hand in the pie, although actual authorization and scheduling will be through WPB.

Although they are manifestly an experiment, considerable interest is being evidenced by railroad men in the 30 "aluminum" box cars which Reynolds Metal Co. is building for use in high speed trains (see IRON AGE, Oct. 5, 1944, page 97). These, it is thought, may make it possible to take full advantage of available power on diesel-drawn passenger trains, thus effecting still further operating economy.

Both in conjunction with aluminum construction and separately, high tensile steel producers are actively pushing increased use of their product and finding considerable success. Special sections are being developed, although it is found that high tensile cannot be used in certain portions. Most recent inquiry involving substantial amounts of high tensile material was for 250 50-ton box cars for Santa Fe.

Skeptics contend that the real test of the aluminum pudding will come not in the experimental cars, whose selling price probably is not concerned with long term production profit, but when the economies effected by such cars are fully determined. This, it is contended, will be the margin between acceptance and rejection, although it is admitted that, on the basis of reciprocity, the aluminum companies may cut themselves in for a slice of business if they are anywhere within shooting range.

Passenger car builders are expectant that permission to go back into production will be effective in the second quarter. First schedules, it is believed, will be confined to standard cars, barring lounge, parlor and other so-called luxury cars. No doubt the first on the tracks when this relaxation occurs, will be 27 nearly completed cars under construction at Budd Mfg. Co. for Santa Fe, frozen since the war began.

10 Year Expansion Program Disclosed by Canadian Utility

Toronto

• • • W. G. Murrin, president of British Columbia Power Corp., announced a plan for expansion of the company's public services that is expected to result in expenditures of $50,000,000 over a 10-year period. The phases of the project are:

(1) $17,000,000 for completion of initial units of the Bridge River hydroelectric project; (2) $16,000,000 for accommodating the subtransmission and distribution facilities to the expanding needs of Vancouver; (3) $14,000,000 for remodeling the street car system on the lower mainland and Vancouver Island, including provision for trolley busses; (4) $3,000,000 for improvements to Vancouver and Victoria gas systems, and a new gas manufacturing unit at Victoria.

The Bridge River project contemplates the $17,000,000 expenditure within 10 years, with eventual additions to the plant that ultimately would mean an installation of 650,000 hp. The first unit would develop about 105,000 hp. Vancouver would be served by one of the largest power transmission lines in America. Extending over a distance of 130 miles with a 220,000 voltage, the 650,000 hp. is about three times as large as the present facilities.

GLIDING GIANT: *Carrying a special type light tank, this British Hamilcar glider is towed by a four engine craft. In the Normandy invasion action it was carrying a tank built by Marmon-Herrington.*

WLB Shifts Responsibility For Steel Wage Increases to OPA

Washington

• • • By checking the decision of the President on whether the Little Steel Formula should be abandoned because WPB couldn't say what the effect of such an increase would have on prices, the board shifted the immediate responsibility for wage increases to OPA Administrator Chester Bowles.

Labor sources said they regarded the decision as a distinct set-back. Industry sources said that the decision was what the President wanted because it now leaves him free to move in either direction.

Public and industry members joined in an eight to four vote to reject an AFL proposal to "realistically adjust the Little Steel Formula with the increased cost of living."

See pages 102 and 103 for other Wage News

Dissenting labor members called the decision an "inexcusable dereliction of duty."

The majority stated their intention to send a factual report on the relationship of wages and the cost of living which would not recommend "action one way or the other with regard to the Little Steel Formula," leaving the President free to make his own decision.

While the report is being transmitted through Fred Vinson, economic stabilizer, soon, it is expected that this delay plus the delay in seeking a report from OPA on the effect of wage increases on prices, will consume more than enough time to put the decision over until after election day.

While the majority decision drew hot words from labor members who had urged that any wage increases be made now, WLB indicated that the report would include suggestions for broadcasting or clarifying the board's authority in dealing with specific inequities and with reconversion adjustments.

This portion of the resolution leads observers to infer that WLB might ask for authority to make reconversion wage adjustments which rumor has said would form the basis of any wage increases awarded by the President. The recent leak of the "confidential" OPA Research Division report would tend to confirm this belief, if the leak was a part of Administration strategy, as many assert.

If the President changes the wage policy, the resolution said that the board could judge all cases now pending on the new basis.

The board will now consider what if anything it may award to the unions of the demands supposed to be within the wage stabilization policy. These demands are: Wage differentials and rectification of plant shift differentials and changes in the bracket system and in practices relating to substandard wages.

If WLB labor members' blistering words were serious, speculation has protest strikes on the way and the possibility that the labor members may walk out on WLB just as John L. Lewis did when he broke up the now defunct National Defense Mediation Board.

Labor members drew no fire from William H. Davis WLB chairman who declined to comment on their remarks. He insisted that differences were not of purpose but of method.

At the labor members' press conference, Emil Rieve, president of the CIO Textile Workers, said that the "board action is similar to General Marshall telling the President that he had no recommendations on what to do."

George Meany, secretary-treasurer of the AFL, quickly added: "Because he did not known what the Germans were going to do."

A statement by the labor members said: "The program which it (the board majority) has proposed is compounded of timidity, contradictions and double-talk."

The refusal to make recommendations with respect to the formula was described by the labor members as "tantamount to an admission by the public members that they are not competent to perform their duties."

The steel panel's conclusion in its report to the board was that an increase in wages would not be inflationary. It is apparent that the public members of WLB differ with their associates on the panel.

COMING EVENTS

Oct. 12-14—The Electrochemical Society, Inc., Buffalo.

Oct. 12-14—American Society of Tool Engineers, semi-annual meeting, Syracuse, N. Y.

Oct. 16-20—National Metal Congress, Cleveland.
- American Society for Metals.
- American Welding Society.
- Society for Experimental Stress Analysis.
- American Institute of Mining & Metallurgical Engineers, Iron and Steel Division and Institute of Metals Division.
- American Industrial Radium and X-Ray Society.

Oct. 31-Nov. 1-2—American Institute of Steel Construction, annual meeting, Atlantic City, N. J.

Nov. 2-3—Industrial Management Society, National Time and Motion Study Clinic, Chicago.

Nov. 9-10—SAE Fuels & Lubricants, national meeting, Tulsa, Okla.

Nov. 19—Gulf Coast Chapter, Institute of Scrap Iron & Steel, Inc., annual fall meeting, Dallas, Tex.

Nov. 27-Dec. 2—National Exposition of Power and Mechanical Engineering, New York.

Dec. 4-6—SAE National air cargo meeting, Chicago.

Jan. 8-12—SAE Annual Meeting, Detroit.

Jan. 10-11—Institute of Scrap Iron & Steel, Inc., annual meeting, Cincinnati.

51 Inch Strip Mill Is Canadian Steel Construction Project

Toronto

• • • The Steel Co. of Canada, Ltd., will proceed with a large scale expansion program to be undertaken at the Hamilton works according to a decision reached by directors a few days ago when they approved immediate start on construction of a modern 51 in. strip mill for the production of sheets and tin plate. The proposed unit will represent an expenditure of approximately $8,000,000 which will be in addition to the $6,000,000 spent since the outbreak of war on the 110 in. plate mill and the tin plate plant.

The proposed new installation will hot roll steel in widths up to 51 in. from plate thicknesses down to sheet gages as light as .050 in. in thickness, and will deliver the light gauge steel at speeds as high as 2000 ft. per min. in continuous legths of 1300 ft. or more. Incidental machinery and equipment for shearing, flattening, scrubbing, etc., to enable production

of a full line of finishes required to service the market for hot rolled sheets will be installed. Buildings to house the new equipment will be a quarter of a mile in length and will cover an area of about four acres. Preliminary construction work now is underway.

Scope of the Steel Co. of Canada's expansion program is reflected in an increase of over $14,000,000 in the valuation of fixed assets in the balance sheet between the end of 1939 and 1943, from $49,746,000 to $63,983,000.

August Steel Shipments Reflect 77,000 Ton Increase

• • • August shipments of finished steel products according to the American Iron & Steel Institute after allowance has been made for inter-industry shipments were 77,000 tons ahead of comparable July figures. While a slight increase would have been expected in August because of shutdowns on Independence Day in July, the better showing was probably due to a slightly better product mix. Plate shipments in August were down some from July and this available space was reflected in a greater output of hot rolled sheets in August. Wire products showed a substantial increase in August over July which probably reflected more liberal WPB directives for these items.

American Iron and Steel Institute Capacity, Production and Shipments

STEEL PRODUCTS	Number of Companies	Items	Maximum Annual Potential Capacity, Net Tons	AUGUST, 1944 Production Net Tons	AUGUST, 1944 Production Per Cent of Capacity	AUGUST, 1944 Shipments (Net Tons) Total	AUGUST, 1944 Shipments (Net Tons) To Members of the Industry for Conversion into Further Finished Products	TO DATE THIS YEAR Production Net Tons	TO DATE THIS YEAR Production Per Cent of Capacity	TO DATE THIS YEAR Shipments (Net Tons) Total	TO DATE THIS YEAR Shipments (Net Tons) To Members of the Industry for Conversion into Further Finished Products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	48	1				759,985	263,377			5,852,659	1,931,095
Structural shapes (heavy)	10	2	8,942,250	324,318	43.9	297,809		2,654,326	45.3	2,575,702	
Steel piling	4	3		8,033		9,339		49,187		51,071	
Plates (sheared and universal)	23	4	16,113,620	1,047,554	76.7	1,003,342	145,030	9,055,061	84.3	8,795,801	525,417
Skelp	6	5				70,454	54,684			556,500	434,352
Rails—Standard (over 60 lbs.)	4	6	3,625,000	195,819	63.7	177,191		1,531,655	63.4	1,510,585	
—All other	6	7	525,000	14,673	33.0	17,328		128,657	36.8	131,611	
Splice bars and tie plates	13	8	1,743,500	66,179	44.8	66,350		539,226	46.4	552,403	
Track spikes	10	9	350,640	12,763	43.0	13,514		98,350	42.1	104,927	
Hot Rolled Bars—Carbon	37	10		742,066		582,049	79,257	5,823,911		4,819,965	622,135
—Reinforcing—New billet	16	11		49,333		51,675		319,439		338,497	
—Rerolled	14	12		3,117		3,452		46,708		57,532	
—Alloy	24	13		263,867		188,295	33,820	2,085,688		1,516,885	290,799
—Total	47	14	21,965,470	1,058,383	56.9	832,471	113,077	8,275,746	56.5	6,732,879	912,934
Cold Finished Bars—Carbon	23	15		156,260		155,585		1,201,247		1,196,609	
—Alloy	22	16		32,619		31,344		275,506		248,035	
—Total	30	17	2,728,850	188,879	81.8	186,929		1,476,753	81.2	1,444,644	
Tool steel bars	17	18	262,120	12,804	57.6	12,812		96,615	55.3	92,780	
Pipe and Tubes—Butt weld	16	19	2,186,870	124,685	67.3	125,196		948,659	65.1	948,286	
—Lap weld	8	20	920,200	46,419	59.5	47,160		384,639	62.7	384,922	
—Electric weld	9	21	1,304,100	76,851	69.5	79,097		548,753	62.9	544,542	
—Seamless	15	22	2,617,300	189,056	85.2	194,797		1,554,151	89.1	1,568,246	
—Conduit	7	23	187,000	5,425	34.2	6,325		38,440	30.8	38,510	
—Mechanical tubing	12	24	1,050,400	69,904	78.5	65,298		546,748	78.1	541,900	
Wire rods	26	25	7,019,370	388,390	65.0	119,621	39,481	3,028,075	64.7	926,080	304,148
Wire—Drawn	42	26	5,670,920	312,696	65.1	192,041	9,229	2,453,759	64.9	1,441,963	68,070
—Nails and staples	19	27	1,247,720	52,640	49.8	53,177		450,309	54.1	440,062	
—Barbed and twisted	15	28	546,030	21,948	47.4	22,190		169,399	46.5	167,495	
—Woven wire fence	16	29	1,112,200	32,313	34.3	31,790		255,212	34.4	251,092	
—Bale ties	12	30	149,500	6,254	49.4	6,980		52,437	52.6	50,703	
Black Plate—Ordinary	9	31				44,299	22			321,045	906
—Chemically treated	8	32	464,000	9,424	24.0	8,873		99,235	32.1	93,711	
Tin and Terne Plate—Hot dipped	9	33	3,719,650	197,675	62.7	192,589		1,276,622	51.5	1,346,392	
—Electrolytic	10	34	2,155,100	51,508	28.2	45,707		439,688	30.6	414,387	
Sheets—Hot rolled	28	35	19,932,600	1,139,406	67.5	574,176	27,975	8,425,510	63.4	4,262,175	175,314
—Cold rolled	14	36	7,316,380	322,910	52.1	167,639		2,456,724	50.4	1,328,150	
—Galvanized	15	37	2,826,130	124,451	52.0	125,423		869,749	46.2	858,807	
Strip—Hot rolled	22	38	8,584,200	230,212	31.6	146,445	25,039	1,787,345	31.2	1,141,245	185,935
—Cold rolled	34	39	3,249,470	99,257	36.0	95,461		784,787	36.2	734,275	
Wheels (car, rolled steel)	5	40	348,800	25,764	87.2	24,594		195,797	84.2	191,255	
Axles	6	41	416,170	17,420	49.4	16,357		137,383	49.5	132,273	
All other	5	42	172,290	5,033	34.5	4,669		30,650	28.7	30,584	
TOTAL STEEL PRODUCTS	154	43				5,837,328	677,914			46,559,642	4,538,175
Effective steel finishing capacity	154	44	64,722,000								
Per cent of shipments to effective finishing capacity	154	45				94.1%				97.4%	

Steel Industry Case Histories Show Veterans Want Quiet Atmosphere

New York

• • • Case histories covering a score of war veterans rehired by companies in the steel industry indicate that often a desire for comparatively quiet working conditions is expressed by the men requiring vocational assistant. At least, reports the American Iron & Steel Institute, it appears noise is bothersome until these individuals become accustomed to civilian life once more.

In nearly all the instances where quiet surroundings were desired, steel companies accommodated the ex-soldiers by switching them to departments offering less noise. A former mail truck driver, returning from the SeaBees, was placed in a storeroom; a motor inspector helper was transferred from a mill to a coke plant electrical department, a former nail machine operator was transferred to the relative quiet of a floor crew laying out plates. Other veterans desiring quiet were placed in gate watchman's jobs, raw materials yards, timekeeper offices and so on.

The case histories show that fitting returned service men into suitable jobs often requires considerable time and in some cases numerous new positions must be tried. However, the industry has had such high success so far in helping ex-soldiers adapt themselves to peacetime employment that rehiring officials contemplate the return of the bulk of the veterans with confidence.

Steel companies find that getting a story of the individual's war experiences which is as detailed as possible helps greatly in the proper handling of returned veterans. Often the initial interviews must be conducted with great skill in order to obtain the data which will enable the company to assign the man satisfactorily. After being subjected for months or years to a sharply changed environment where entirely new stimuli were demanded, many a returned fighter finds his adjustment back into civilian life a task.

Several companies have selected for rehiring officials employees who are World War I veterans, since these men have appreciation of the attitudes and problems facing individuals newly discharged from the armed services.

After the individual's story has been obtained and a suitable position selected, on the basis of possible new skills and the man's physical condition, the facts are passed on to the supervisory force, which sets up safeguards or gives the man special consideration.

Then if the job is not satisfactory after the individual has tried it, assignment to other work is made.

Study of the case histories which the steel industry has compiled as an aid to its efforts to handle returned veterans intelligently, shows that in some cases individuals are given a certain amount of time off weekly for medical treatment. In all cases the men are encouraged to set their own work pace.

WPB Construction Bureau Under Vice-Chairman H. G. Batcheller

Washington

• • • WPB Chairman J. A. Krug has announced that, in order to provide a centralized point of control over all matters pertaining to construction within WPB, a construction bureau is being established, responsible to H. G. Batcheller, operations vice-chairman. The bureau will be headed by Arthur J. McComb, of Montclair, N. J., former vice-president of the Otis Elevator Co., who has been serving as Director of the Office of Industry Advisory Committees.

The construction bureau will include the existing Building Materials Division, the Construction Machinery Division, the Plumbing and Heating Division and the bulk of the Facilities Bureau, which is being abolished.

A Bureau Requirements Committee is being established to pass on all construction requirements and construction programs and all major construction projects. It will also review the requests of the Divisional Requirements Committees of the component divisions of the Construction Bureau. Appeals from its determinations will be taken only to the Central Requirements Committee of WPB.

HOW SHE BOUNCES: *At Routot, France, British Tommies fire the new 7.2 howitzer which has to be set up on specially constructed ramps. The new howitzer weighs 10 tons and throws a 200 lb. shell 16,000 yds. The recoil is terrific in spite of hand brakes.*

WPB Staff to Drop to 233

Washington

• • • The WPB Steel Division has agreed with the agency's top command to reduce its civil service personnel to 233 by the end of November. At that time the division will have 31 dollar-a-year men. Peak employment in the division, reached last year, was 750. This included 75 dollar-a-year men.

All those civil service people who will be separated by the division have received notice, including 30 involuntary separations.

War Department Ordering Steel Sheds for Materials Storage

Washington

• • • **Faced with the problem** of quick disposition of unsold war equipment in plants that are reconverting to peacetime production, RFC in cooperation with the War Department has found a solution through the erection of prefabricated steel warehouse sheds in which the material will be temporarily stored. So far RFC has ordered 600 sheds, 500 from the Great Lakes Steel Corp., Detroit, and 100 from the American Rolling Mill Co., Middletown, Ohio.

These sheds will be 20 ft. wide and 100 ft. long and will be built of corrugated galvanized sheet steel. Each will weigh about 6.5 tons. While this is the standard size it is probable that some sheds to be ordered will be 20 ft. by 200 ft. While no definite total number to be purchased has been decided on, it is expected that about 5000 will be ordered, covering some 10,000,000 sq. ft.

Under the plan worked out war equipment owned by the government will be removed from the reconversion plants and the warehouse sheds fabricated at the sites of the plants, if space is available, but if not nearby space will be leased.

To make it easy to store and remove the equipment the sheds will have end and side panels. The equipment will be kept in the warehouse sheds until it is either sold or can be removed.

Purchase Orders Permitted To Anticipate Removal of Controls

Washington

• • • **With the provision** that the manufacturer does not schedule it for production, he may accept a postwar purchase order now which is not to be filled until after the removal of applicable WPB restrictions.

Citing the recent Interpretation 11 to Priorities Reg. 1, WPB made this announcement on Oct. 16.

"Some orders and regulations of WPB forbid the placing or acceptance of purchase orders for certain materials or products unless the purchase orders bear specified preference ratings, or unless they are accompanied by an allotment symbol or special authorization, or unless they meet some other condition," said the statement. "Such provisions do not, however, prohibit the placing or acceptance of a purchase order which by its express terms, is not to be filled until after removal of such restrictions by WPB."

All Agencies Agree On Termination Form

Washington

• • • **Vast saving** in time and expense, through the operation of new uniform and simplified government war contract termination reporting procedure, was predicted recently by F. Stuart Fitzpatrick, chairman of the Advisory Committee on Government Questionnaires.

The reporting procedure has been developed jointly by the committee, the Bureau of the Budget, the Office of Contract Settlement and representatives of government contracting agencies.

The advisory committee on questionnaires was set up two years ago at the request of Harold D. Smith, director of the Bureau of the Budget to assist the bureau in simplifying and eliminating unnecessary government questionnaires and other forms burdensome to business. Represented in its membership are the Chamber of Commerce of the United States, the National Association of Manufacturers, the American Retail Federation, the Controllers' Institute, the National Industrial Council, the American Trade Association Executives and the National Association of Commercial Organization Secretaries.

Government agencies have accepted the subcommittee's suggestions by which companies can supply sufficient information for fair, accurate and fast settlements, and yet avoid a complexity of forms and procedures which would involve tedious clerical work, as well as demanding excessive time of executive personnel.

"One advantage of the new procedure," said Mr. Fitzpatrick, committee chairman, "is that business firms can wind up their fixed price or lump sum contracts with any one of the contracting agencies — War, Navy and Treasury Departments, Foreign Economic Administration, Maritime Commission and Smaller War Plants Corp.—using a standard form and uniform procedure."

Mr. Fitzpatrick cited important improvements resulting from the joint efforts.

GI'S TRY FAMED 88MM.: *American soldiers try firing a German 88mm. gun captured near Metz, France. It has been one of the enemy's best artillery weapons of this war.*

COOL WATER, OILS AND SOLUTIONS OR AIR AND GASES...OR CONDENSE STEAM AND VAPOR

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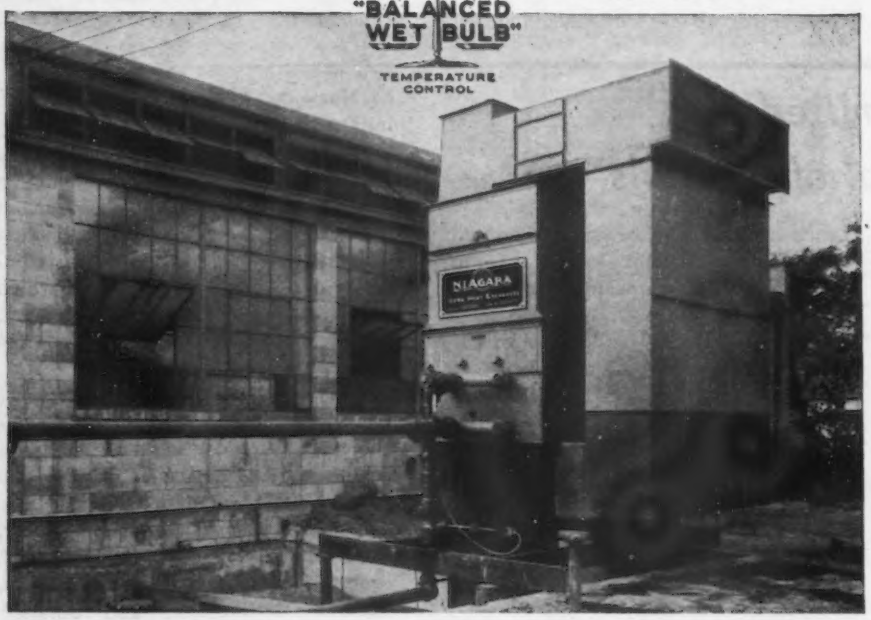

● This new method offers the advantage of lower cost thru the saving of 95% of cooling water. It avoids the risk of shut-downs from interrupted water supply. It provides a closed circuit saving the expense of water treatment. It saves the installation cost of water pumps, piping and extra equipment.

In addition, it offers precise temperature control, both during cooling operation and in bringing cooled liquids back to desired temperatures after shut-downs. This is accomplished with the Niagara "Balanced Wet Bulb" temperature control which always provides the correct admixture of fresh outdoor air with recirculated air. Full capacity is always maintained.

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Industrial Briefs

• BRANCH OFFICE—The Rubber Chemicals Division of E. I. du Pont de Nemours & Co. plans to establish a branch office and completely equipped technical service laboratory in Akron, Ohio.

• CANADA'S NO. 1 — Colonial Tool Co. Ltd., Windsor, Ontario, now has in operation what is believed to be the most complete and modern commercial heat-treating plant in the Dominion of Canada. The company has in operation some 22 furnaces and baths for heat-treating, carburizing and cyaniding.

• ACQUIREMENT — Continental Can Co., Inc., has approved the acquisition of the assets and business of Owens-Illinois Can Co., a subsidiary of Owens-Illinois Glass Co.

• NEW OFFICE—Jones & Laughlin Steel Corp., Pittsburgh, has opened a new sales office at New Haven, Conn. Robert B. Algie has been made resident manager of sales.

• APPOINTS DISTRIBUTOR — Allied Radio Corp., Chicago, has been appointed exclusive midwestern distributors for Creative Plastics Corp.

• GRANTED PATENT — LaSalle Steel Co., Chicago, has been granted a patent by the U. S. Patent Office covering such steels as are sold under the trade name STRESSPROOF. The patent, U. S. 2,320,040, covers the method as well as resultant products.

• NEW NAME—McCord Radiator & Mfg. Co., Detroit, has changed its name to McCord Corp. The change was dictated by the wider range of products the company expects to make after the war.

• CHANGES NAME — The Black & Decker Electric Co., Kent, Ohio, has changed its corporate name to The Lamb Electric Co. There will be no change in either the activities or the management of the company.

WITH FASTER, CHEAPER MATERIALS HANDLING

COST of postwar production is probably causing you more concern right now than any other factor in your peacetime plans. If so, a good place to start considering ways of lowering unit costs in your plant is to check what modern materials-handling methods can do to help.

Experience has shown many manufacturers (no less concerned about price than you are) that the right hoist in the right place cuts man-hours per part produced . . . aids production planning . . . utilizes more profitably every foot of floor space . . . reduces accident-frequency rates . . . and adds much to the well-ordered, production-boosting appearance of plant departments.

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The R & M Type F½ Hoist has 1000 — 2000-pound capacity. It is provided with pendent, push-button control. A step forward in improved design, better materials, and manufacturing economies that provide a better hoist at lower cost in both purchase price and operation.

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Cleveland . . . 470 Rockefeller Bldg.	Pittsburgh . . . . H. W. Oliver Bldg.
Dallas . . . . . 1100 Cadiz St.	Providence . . . . . 44 Clifford St.
Denver . . . . . 1420 16th St.	San Francisco, 116 New Mtgmry St.
Detroit . . . . . 2921 E. Grand Blvd.	Seattle . . . . . 216 Walker Bldg.
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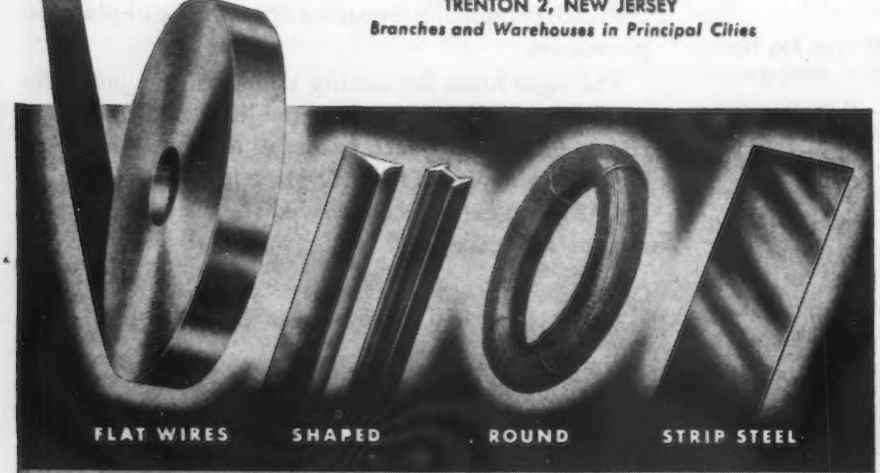

FLAT WIRES SHAPED ROUND STRIP STEEL

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Induction Heating Supersonics and X-Ray Feature Conference

Chicago

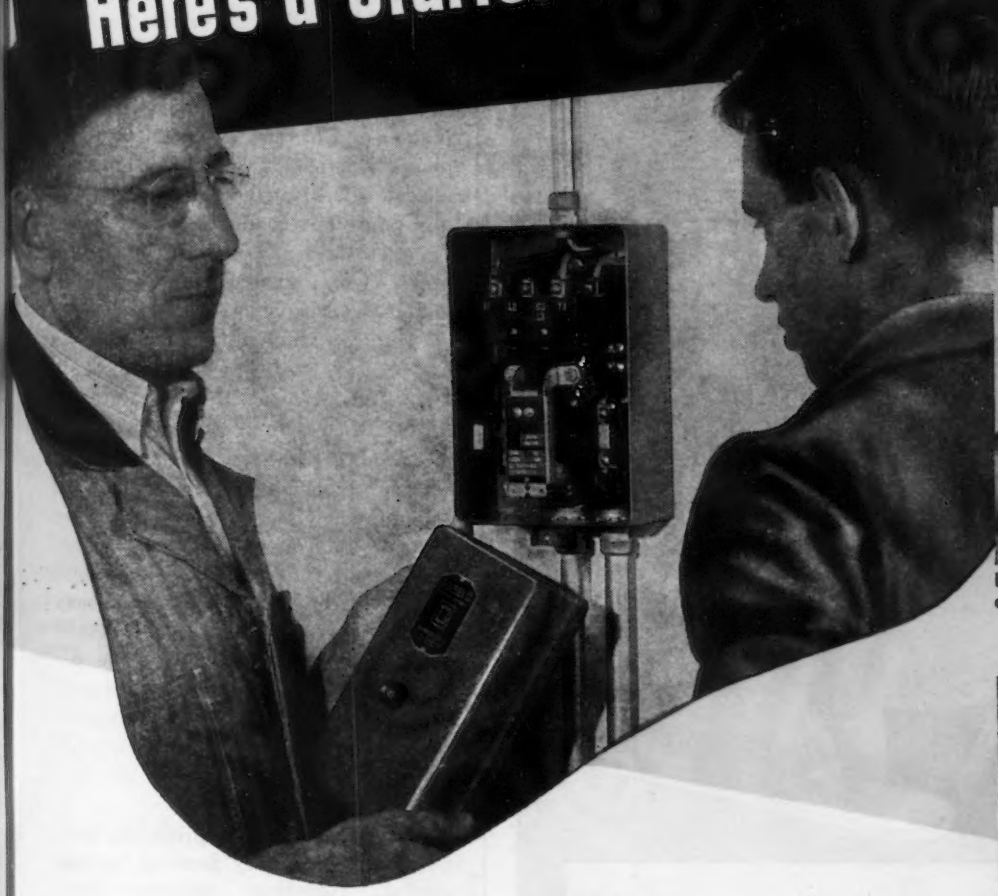
• • • New applications and developments in the use of electronic principles in the metals field were discussed at the National Electronics Conference held here Oct. 5 to 7.

Induction heating and dielectric heating generators, up to 20 kw. useful high frequency output, which are designed so as to deliver a constant rated power to a varying load were described by Dr. Eugene Mittelmann, Illinois Tool Works, in a discussion of "New Methods and Techniques in High Frequency Heating." Dr. Mittelmann pointed out that most industrial applications of high frequency power are characterized by the fact that the output terminals of the generator have to deliver power to a large variety of load impedances. Furthermore, in the great majority of industrial applications the impedance value of the once selected load itself varies in wide limits during the heating cycle. He cited the heating of ferrous metals beyond the point of magnetic transformation, when the originally low impedance load changes to one of high impedance; the heating of thermo plastic materials, where the power factor increases with temperature; and the curing of rubber, where the power absorption by the load goes through a maximum and minimum during the heating cycle.

Such load behavior, he continued, means that the generator is unable to deliver its rated power output to the load except for a short fraction of the total heating cycles where matching conditions happen to exist between load and generator.

Increased efficiency and greater effectiveness can be obtained if generators are designed which are able to deliver a constant rated power to a varying load. Dr. Mittelmann described the corresponding changes in reactance in the generator that must be made to maintain matching between load and generator and indicated that both induction heating and dielectric heating generators are available from his company that satisfy such conditions. In the induction heating unit, the rematching takes places automatically at the magnetic point of transformation in steel. In dielectric heating units, where the heating cycle is considerably longer, the rematching is continuous. The

Here's a Starter You Can Really Get At!



Loosen two screws and the arc chamber cover comes off. You can inspect every contact surface at a glance.

The entire armature and movable contact assembly can be lifted off after two more screws come out. You can easily slip off the magnet coil after disconnecting two wires from its screw type terminals.

Contacts are attached with separate screws—you can remove or replace them without disturbing any wiring—and a screw driver is all you need.

Peak operating efficiency and long life of electric motor starting equipment depend largely upon regular inspection and occasional servicing. Today, with every minute at a premium, this inspection and servicing job is more important than ever.

The complete accessibility of Square D starters means faster, easier inspection and servicing. Their simple construction enables the electrician to exchange magnet coils, contacts or overload relays in practically no time at all—using only a screw driver.

Write for Catalog Bulletin 8536 which describes Square D's complete line of A.C. magnetic starters. The starter illustrated is Size I for 3 phase motors up to 5 HP. at 220 volts or 7½ HP. at 440 volts. One smaller, and three larger sizes are also available.

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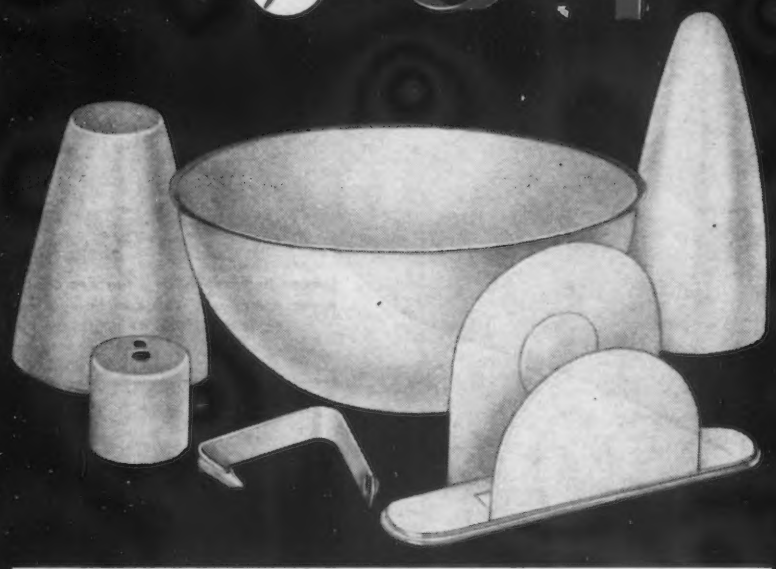
COLD ROLLED STRIP STEEL



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The crackproof, peelproof finish of zinc coated Thomastrip will adhere to the steel to the limits to which the base metal is drawn. Available in various weights of coatings, in coils or cut lengths, dull or bright finish with uniform coating on both sides, and having temper ranges from soft to full hard, Thomastrip electro-coated with zinc will meet a wide variety of product and production requirements. This durable coating provides a non-porous final finish, aids die life, and is suitable for spot welding and soldering operations. Coated edges can be furnished on wide or narrow strip including flat wire.

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SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

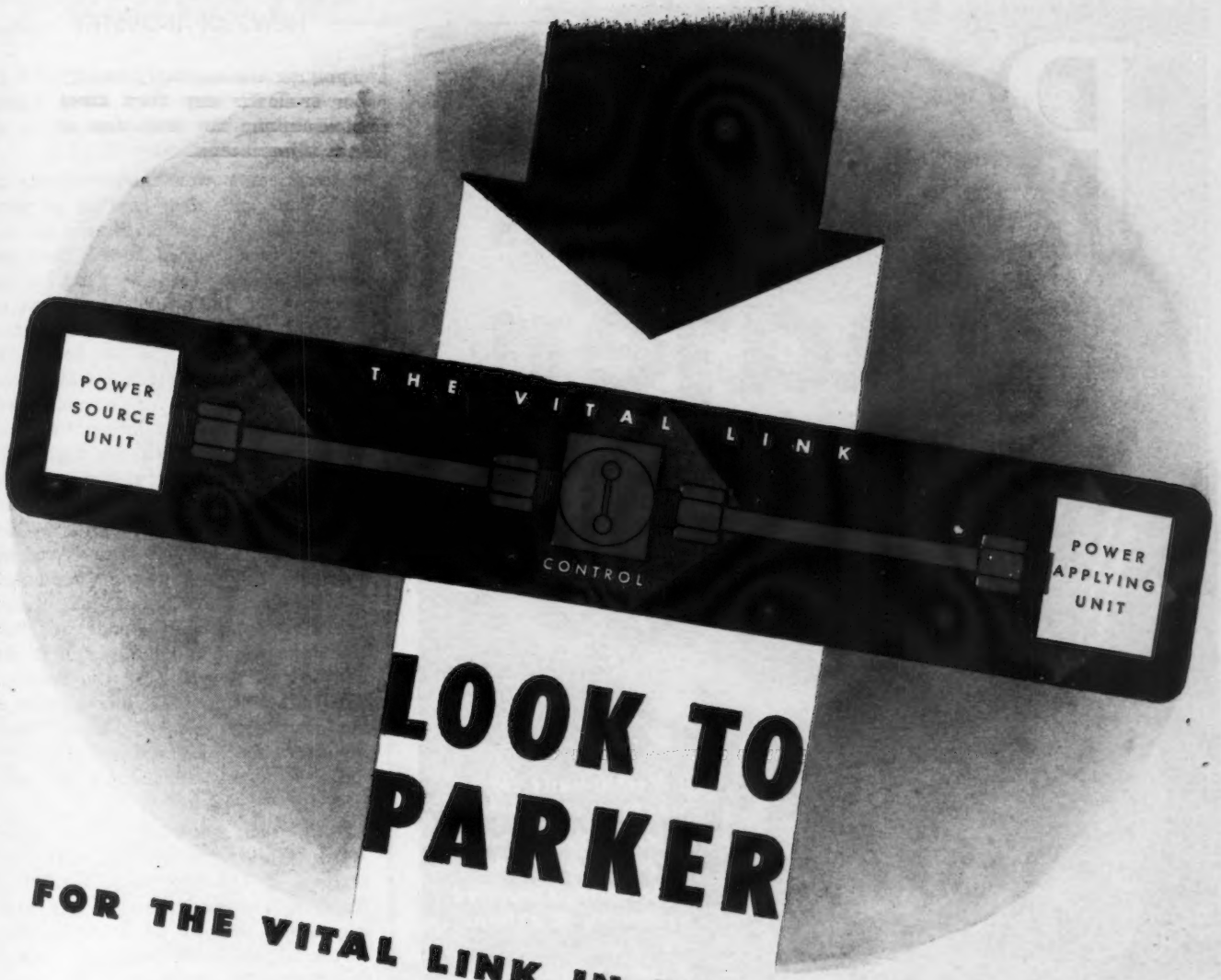
speaker cited examples where it was possible to use generator of smaller rating by utilization of the rematching principle.

In another paper presented before the high frequency heating session, C. J. Madsen and R. W. Baker, Westinghouse Electric & Mfg. Co., explored the fields of induction and dielectric heating both as to conducting and non-conducting materials. Practical factors which affect the application of high frequency technique to industrial problems were considered in detail, including resistance, loss factor and size of material being heated as well as the current and voltage in the load circuit components.

Although many high frequency heating problems can be calculated and the economic factors determined from a study on paper, it was pointed out that considerable development work with the parts to be heated may be necessary. In this case the details of coil design, which cannot be determined from calculation alone, may be principally involved, and occasionally dielectric applications require similar study in the design of electrodes.

Current industrial applications utilizing high frequency heating include brazing, soldering, melting, heat-treating, case hardening, sterilization, drying, and curing, the speaker stated. The materials treated include iron, steel, brass, copper, plastics, wood, paper, rayon, nylon and other synthetics, rubber and food.

Comparing induction heating with the heat concentrations obtained with the oxy-acetylene flame, Dr. Wesley M. Roberds, RCA-Victor Division of Radio Corp. of America, indicated that in the latter case because the transfer of enegy is extremely low, the electrical heating equivalent of about 5 kw. per sq. in. is the maximum obtainable at present. In electronic induction heating on the other hand it is not difficult to put 100 kw. into a square inch surface area with an overall efficiency of 50 per cent. Because the current penetration into the work is small, the application of 100 kw. per sq. in. may result in a power concentration in volume of 20,000 kw. per cu. in. This ability to create very high power concentrations by induction heating is especially advantageous in processes where it is desirable to confine the heating to a small, sharply defined volume such as in case hardening, welding and brazing. This effect may be achieved by



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We do the engineering from design through to installation. We build the valves and fittings and the tools to handle them.

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RICKERT-SHAFER introduced the Model "T" Die Head for taper threading many years ago. Any degree of taper can be provided. The chasers gradually recede as the thread is being cut. The degree of taper is controlled by the profiles on the outside of the Die Head. Less power is consumed and longer chaser life assured because cutting is done at the front of the chasers. This Die Head snaps open at the end of the thread cut. No chaser marks left on work, an important feature on aircraft threads. Die Head resets with ¼ turn of the handles. Write for complete data.

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applying the necessary energy at high power levels for very short times, thus minimizing the conduction of heat to adjacent areas.

Practical power concentrations in electronic dielectric heating of nonmetals range from 10 watts per cu. in. at a frequency of 10 mc., used for glueing thick wood sections, to 20 kw. per cu. in. at 200 mc., used to seal thin plastic films. In dielectric heating the work to be heated is placed between electrodes which constitute the plates of a condenser. Heating is caused by internal electric losses in the work when a high voltage, high frequency electric field is established between the plates. In induction heating of metals, on the other hand, energy is transferred by bringing the work near an induction coil through which high frequecy current flows. Alternating magnetic flux links the work and induces in it the eddy currents which do the heating. The induction method is essentially a surface heating phenomenon while dielectric heating distributes the heat quite uniformly throughout the volume of the load.

In another session, Dr. F. A. Firestone, University of Michigan, described for the first time the Sperry Supersonic Reflectoscope, which utilizes sound waves as a device for inspecting the interior of metal parts. The instrument sends into the metal part to be inspected a short train of supersonic waves, above the audible frequency. Any flaws on the interior give reflections back to the sending point before the reflection is received from the other side of the piece. Many feet of metal can be penetrated.

An equally important application, Dr. Firestone said, is in the measurement of the thickness of a piece when its opposite side is inaccessible. Also, discontinuities of bond of plated or soldered surfaces can be detected.

The operation of the Reflectoscope involves placing an X-cut quartz crystal on top of the piece to be inspected, first applying oil if necessary to insure good contact. When energized electrically, the crystal will vibrate and send supersonic radiations down into the piece, which, on their return after hitting a flaw or the other side of the piece, generate voltage in the crystal. This can be recorded, and, by placing a camera in front of an oscilloscope, a permanent record made.

Timing marks, calibrated to the distance sound will travel in the material being examined, appear on the oscillograph screen. When flaws occur, thus deflecting the radiations and

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Excessive consumption of lubricating oil is too often blamed on the machine using it . . . or, worse still, it is completely overlooked. Usually it is the result of using the wrong oil for the job and can be corrected by a careful study of the machine and the conditions under which it operates, by a qualified lubrication engineer. Sun Engineers have helped hundreds of plants to cut oil consumption by putting the right oil in the right place.

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creating a variation in the record, their location can be determined. By moving the crystal, it is possible to locate a flaw within ⅛ in. vertically and from ⅛ to ¼ in. laterally. The equipment used by Doctor Firestone is practical in examining thicknesses as great as 10 ft. in aluminum, and comparable distances in steel.

The instrument can be used to measure grain size through measurement of absorption of the waves by the material. The larger the grain size, the smaller is the transmissibility at a given wave length.

Examples were shown in which the instrument was used to examine steel plate and castings, also magnesium plate and aluminum. Doctor Firestone cited some of the considerations involved in examining gray iron castings with graphite inclusions. Difficulties in examining rough castings because of lack of contact of the crystal with their surface, and hence lack of sensitivity, were also mentioned.

Another possible use considered was the examination of spot welds. The speaker raised the doubt, however, as to whether some poor welds might not show good transmissibility.

X-ray pictures can now be taken through pieces of steel a foot thick, using a new 2,000,000-volt mobile X-ray unit developed in the research laboratory of the General Electric Co. at Schenectady. First announcement of the high-voltage device was made here by the scientist in charge of the work, Dr. Ernest E. Charlton.

This doubles the voltage of X-rays available to industry for examining metal sections to find defects. Up to now the most powerful X-ray unit in general use has been the million-volt apparatus developed in the G.E. laboratory. More than 50 of these are now actively serving the war effort in the United States and abroad.

In radiographing an 8-in. steel casting the 2 million volt outfit is 78 times as fast as the million-volt. Under one typical set of conditions cited by Dr. Charlton, 4½ hr. were required to make an exposure through this thickness with a million volts. Two million volts did it in 3½ min. For still thicker sections the ratio is even greater. Two million-volt X-rays make a satisfactory exposure through a foot of steel in about 2 hr. when the Types A X-ray film is used, at a distance of 3 ft. from the end of the tube. For practical purposes such a thickness is opaque to million-volt X-rays.

Collaborating in the development

Blower impellers, like those above . . . field rings like those below . . . are today regular "grist for our mill". That is war production. Soon, let us hope, things of a more peaceful nature will take their place.

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● You can get this bolt, made by either method shown, in any quantity, from *Lamson & Sessions.*

Let us see what happens when you make a comparison of the manufacturing methods by which you may have your bolts made.

If we make this bolt by milling, you are going to tie up a highly skilled machine operator and his machine—both of which could be better employed making some vital part *that can only be made by milling.* If we make this bolt on bolt-making machinery, the process of upsetting requires less personal attention of a skilled operator, manufacture being almost automatic.

If we make this bolt by milling, each operation consists of *removing metal*—one of the slowest and most expensive processes. If we make this bolt by upsetting, *we remove no metal* except when the bolt head is trimmed hexagon. Upsetting, therefore, obviously conserves materials and saves valuable time, equipment and manpower.

If we make this bolt by milling, good practice should produce a completed bolt in *one minute.* By upsetting, production of one bolt takes less than *one second!*

Now let's summarize the foregoing considerations.

If milled from the bar—you need a *greater allotment* of material; *you need more* highly skilled labor; *you tie up use of machine tools* of which critical shortages still exist; *you scrap one-half or more* of the raw material you require; you *double, triple,* or *quadruple* the time required to fill the order.

If produced by upsetting—you need *less than half* as much raw material; you need *fewer skilled* operators; you release *man-power and machine tools* for other purposes; you have a *negligible* scrap loss; you cut time for production by 50% to 75% or more—*and get earlier delivery!*

But this is not the final advantage in having your bolts made by the upsetting method! *Upsetting produces a better bolt than can be made by any other method!* Ask for further information on this subject. It's covered in the books we offer you in the coupon below.

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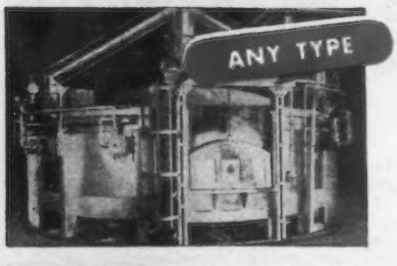

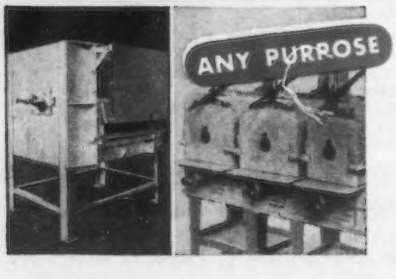

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War's needs have accelerated the development of improved heat-treating techniques designed to get out of steel *all* of the predetermined properties put into it by the steel maker.

Properly applied, *modern* heat-treating—as typified by Austempering, Martempering and Purnellizing—insures improved and more uniform physical properties. Increases machinability. Reduces warpage. Provides freedom from soft spots and cracking. It minimizes re-treating and rejections. The result—a better product at lower cost!

Here at Tate-Jones we offer you thorough and practical knowledge of these advanced heat-treating methods—as well as of conventional heat-treating practice.

We can furnish not only expert metallurgical and engineering advice to improve your heat-treating but can provide the proper equipment to exactly fit your needs:—oil and gas-fired furnaces of all types, either standard or custom-built—salt and lead pots—oil tempering tanks of the latest type—all engineered to operate at maximum efficiency and to give you the results desired.

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both of the million and 2 million-volt machines was Willem F. Westendorp, whose name appears as joint author of the paper presented by Dr. Charlton. In this paper it is explained that even though the new unit weighs 5000 lb., it "is mobile in the sense that it can readily be moved by crane and positioned at any angle by push-button control of fractional horsepower motors."

The 2 million volt apparatus was constructed with the assistance of the engineering staff of General Electric X-Ray Corp., of Chicago. Like that of 1 million volts, it makes use of a multiple-electrode tube, in which the electrons, starting from a heated filament at the top, are speeded in stages until they have the total rated energy. After they attain full speed, which for 2 million volts is about 179,000 miles per sec. or 96 per cent of the velocity of light, they strike a copper-back tungsten target at the end of the tube and X-rays are generated. These may either be squirted from the end or sprayed from the side.

In the million volt outfit the electrons, on their way to the target, were speeded in twelve steps, but the new tube has 24, averaging 83,500 volts at each stage. Construction of the tube was made possible by the use of rings of fernico between the sections of glass. Fernico is an alloy which expands with heat the same as glass, and so the metal and glass can be fused directly together.

High voltage is supplied by a resonance transformer, invention of Mr. Westendorp. Unlike the usual transformer, this has no iron core and the X-ray tube is placed at its axis. Both tube and transformer are in the closed metal tank, 5 ft. in diameter and 8 ft. long, which contains Freon gas (dichlorodifluoromethane) for insulation.

In addition to allowing radiographs to be taken easily through metal sections too thick for lower voltages, 2 million volt X-rays are advantageous also for thinner specimens.

One trouble with X-rays of lower voltage is the great range between exposure times for metal of different thicknesses. If the same specimen has one part that is thin and another that is several times as thick, it is not possible to expose correctly for both at once. The thin parts must be built up with blocks of lead to make the exposure the same throughout. Need for this method is eliminated with the million-volt outfit, and to an even greater extent with 2 million

NEW PESCO ELECTRO-HYDRAULIC *Power Package*

Here's another important PESCO engineering development that's destined to broaden the use and efficiency of hydraulic systems.

This new Electro-Hydraulic Power Package is a complete hydraulic system in itself . . . compact . . . light in weight . . . combining in one unit a reservoir, an electrically-driven pump, a pressure relief valve and a pressure switch.

It's designed to be installed close to the hydraulic cylinder, eliminating long runs of lines, increasing the efficiency of the hydraulic system and reducing the number of operating parts to a new minimum. It will deliver pressures up to 3000 p.s.i., and features the superior performance made possible by PESCO pressure-loaded bushings.

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Aluminum Co. of America	2	Hughes Aircraft Co.	2
American Machine & Foundry Co.	1	International Harvester Co.	1
Beech Aircraft	6	Walter Kidde Co.	5
Bell Aircraft	13	Lockheed Aircraft Corp.	10
Bridgeport Brass Co.	1	McDonnell Aircraft Corp.	2
J. I. Case Co.	7	Noordyn Aircraft	5
Cessna Aircraft	3	Pratt & Whitney	1
Columbia Aircraft	2	Stearman Aircraft Div.	3
Consolidated Aircraft Co.	47	Solar Aircraft	3
Curtiss Wright Corp.	2	Vega Airplane Co.	7
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Douglas Aircraft Co.	57	White Motor Co.	1
Emerson Electric Co.	1	Wright Aeronautical Corp.	1
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Korfund engineers will be glad to help you eliminate the transmission of destructive vibration from your hammers. Write for information.

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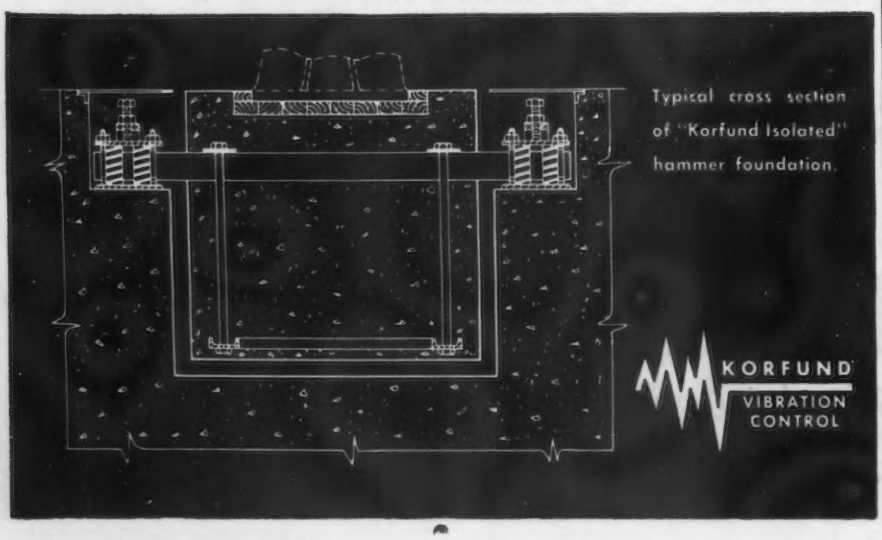

Typical cross section of "Korfund Isolated" hammer foundation.

volts. Excellent radiographs may similarly be taken through objects made of different materials, some of which are much more opaque to X-rays than others.

Another advantage of the high-voltage rays is that the machine may be placed far back from the specimens and a large area sprayed with X-rays as powerful as from a lower voltage tube much closer which would cover only a very small area. Placing the X-ray tube at a distance from the part being radiographed also increases the accuracy of the pictures by reducing distortion since the rays in effect produce a shadow image on the film. A defect in a casting that is close to the film will appear in its actual size, while one that is considerably nearer to the tube will be enlarged. When the X-ray generator is well back, both will record correctly.

Dr. Scott W. Smith, Kelley-Koett Mfg. Co., discussed the limitations of fluoroscopy for X-ray inspection of light materials, but asserted that for certain applications it could be satisfactorily used. Although sensitivity is lower, and no permanent record is furnished, fluoroscopy offers a means of directly viewing the image while the object is in motion, supplying a three dimensional impression, besides eliminating the expense and delay of films.

Photographs of the fluoroscopic image show that greater detail exists than can be seen by viewing the faint image directly, Dr. Smith said. The loss in sensitivity is mainly due to the low brilliance of the image and the deterioration of both apparent contrast and visual acuity at low brightness levels. He emphasized that proper dark adaptation of the eyes is required for maximum sensitivity. He cited a study of the limitations set by the fluoroscopic screen, X-ray tube and other factors in our present methods of fluorscopy, indicating that a sensitivity of at least 5 per cent is feasible in examining light alloy castings and other objects of light material.

Red Cross Gets Steel

Washington

• • • **The WPB's Office of Civilian Requirements has made 400 tons of steel and 15,000,000 ft. of lumber available at the request of the American Red Cross to assist in reconstruction in the path of the recent east coast hurricane.**

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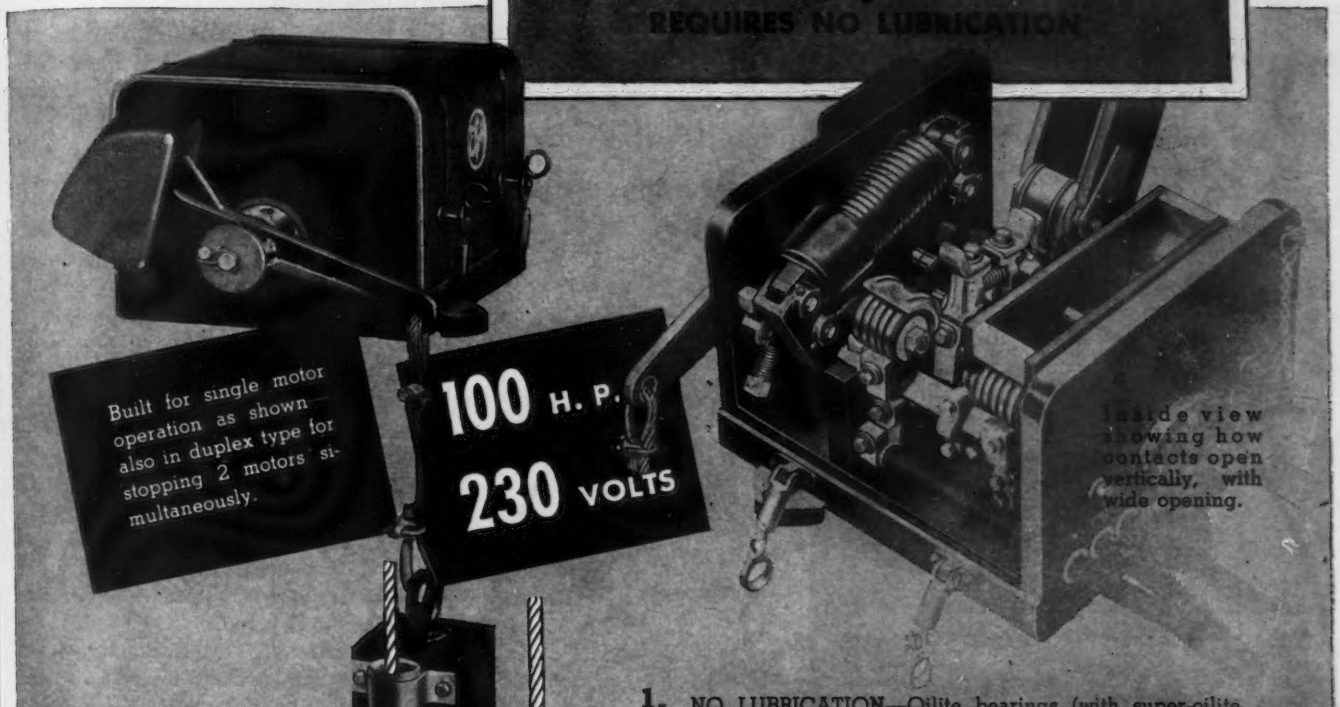
YOUNGSTOWN SAFETY LIMIT STOP for CRANES

REQUIRES NO LUBRICATION


Built for single motor operation as shown—also in duplex type for stopping 2 motors simultaneously.
100 H. P.
230 VOLTS
Inside view showing how contacts open vertically, with wide opening.

HAS 9 OTHER Important Features

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2. MADE OF WELDED STEEL PLATE—Steel cover and suspended weight from billet stock.

3. HIGH INTERRUPTING CAPACITY—Two normally open and two normally closed contacts, mechanically interlocked and with wide, vertical opening, always assure safe interruption of the hoist motor current.

4. NO DEAD-CENTER CONDITION—Positive roller-type locking device on each side—contacts can not separate in any intermediate position of operating lever.

5. FLEXIBLE POWER LEADS—Equipped with lugs on external ends—may be easily removed when desired—plainly marked.

6. SYNTHETIC RUBBER BUSHINGS—Fit the power leads snugly, exclude dust and provide flexible, nonchafing protection—water and oil resistant.

7. MICA INSULATION—Contacts liberally spaced on mica-insulated shafts to give wide separation between opposite polarities.

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9. SMALL RESET TRAVEL—High crane lifts, because the amount of travel between "run" and "tripped" positions, has been kept at a minimum. Split-type, bakelite guide for hoist cable on standard cranes. For multiple-reeved crane blocks, special guides may be bolted or welded to the steel weight.

10. LONG LIFE—Dependable and fool-proof. A test of over ½ million operations has shown the No. 20 is thoroughly sound, mechanically and electrically.

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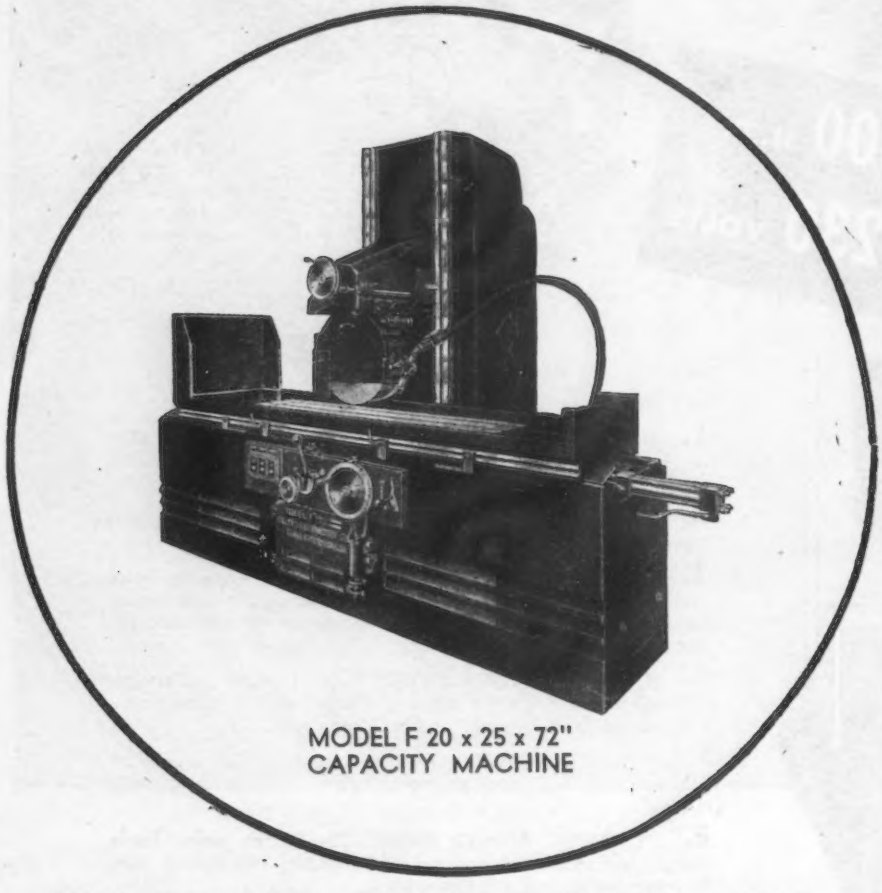

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Coal Mining Manpower At Lowest Ebb Since 1900 Says Report

Washington

• • • Personnel, mining coal is expected to be the lowest since 1900 during the remainder of 1944, according to a Department of Interior report here this week.

With manpower losses exceeding replacement by five per cent in the mines during the first eight months of this year, the failure of the mines to meet annual requirements of 22 million tons of both hard and soft coal was not exactly unexpected.

According to the official text of the department of Interior's official announcement:

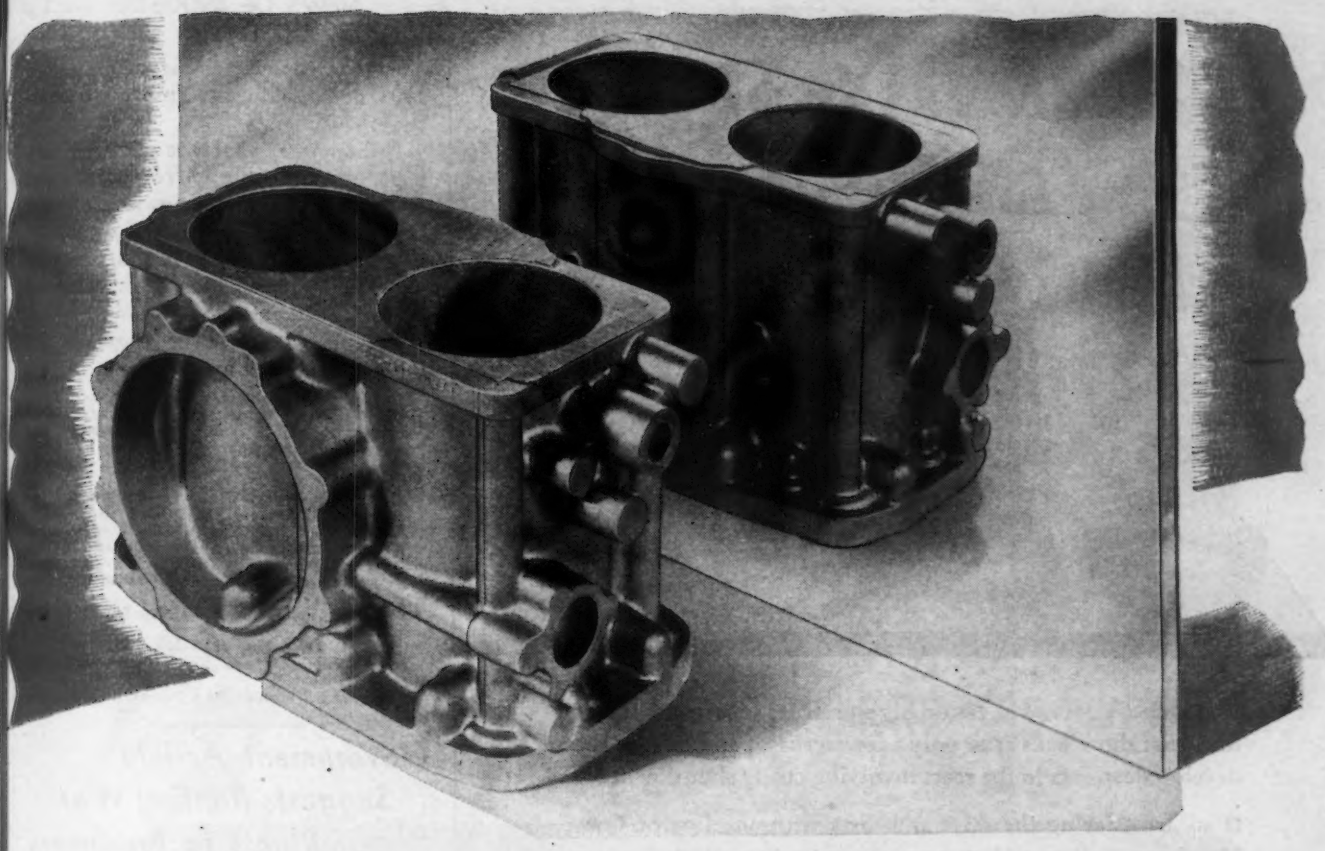
"Mines producing anthracite and the war-scarce kinds of bituminous coals are short more than 32,500 miners of the force that would be necessary to produce enough coal to meet the nation's 1944-45 requirements according to a report made today by Dr. Charles J. Potter, deputy Solid Fuels Administrator, to Solid Fuels Administrator for War, Harold L. Ickes.

"The figures on manpower deficiencies, which are based on a recent Solid Fuels Administration mine canvass, confirm preliminary estimates used in calculating that the nation faces a shortage in the coal year ending next March 31 of 6,000,000 tons of domestic sizes of anthracite and 16,000,000 tons of the better types of bituminous coal.

"In view of this situation, every domestic and industrial consumer must conserve the coal he obtains and should accept whatever alternative coals are available instead of waiting for preferred coals," Dr. Potter said.

"Manpower shortages in the mines are still increasing. From January to September this year losses exceeded replacements by five per cent. By the end of the year, we will be facing the first quarter of 1945, which marks the peak of consumption requirements in the coal year, with the smallest mine labor force in this century.

"Dr. Potter said that the results of the canvass indicated that since Pearl Harbor one of every six men then on the payrolls has left the mines. Employment on January 1, 1942, was 470,000 in bituminous mines and 88,000 in anthracite. As of September 1, 1944, there were only 391,000 bituminous miners and less than 72,000 in anthracite. This is the lowest bi-



With Permite PERMANENT MOLD Castings the MILLIONTH is the image of the FIRST

★ TURN OUT a million Permite Aluminum Alloy Castings by the permanent mold process, and the millionth will not only **look** like, but it will **be** like the first. For the permanent mold casting method employs the same metal mold for every casting poured. Dimensional variations in the castings are entirely eliminated.

Permite Permanent Mold Castings also duplicate your design with greater precision than sand castings. The rigid metal mold shapes castings accurate to ± .010". (Accuracy to ± .030" is standard with sand castings.) And greater tensile strength is produced by the more rapid cooling inside metal walls.

As a result of permanent mold precision, you have less metal to remove. Often, you have fewer surfaces to finish. You may be able to specify thinner cross-sections, saving metal and weight.

Aluminum Industries has been making permanent mold aluminum castings for nearly 25 years. To our casting experience we add a thorough knowledge of aluminum and its alloys.

Our engineers will be glad to make recommendations on how Permite Permanent Mold Aluminum Castings may help you reduce your production costs. Submit your requirements without obligation.

ALUMINUM INDUSTRIES, Inc.
CINCINNATI 25, OHIO

Chicago: 616 South Michigan Ave.
Detroit: 809 New Center Building
Los Angeles: 324 North San Pedro St.
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PERMITE ALUMINUM ALLOY CASTINGS

DO YOU NOW HAVE VALVES on high-pressure superheated steam lines that show leaks after only a few weeks' operation? Or that develop deep cuts in the seats involving costly shut-downs?

If so, hard-facing the seats and discs with an alloy of Coast Metals, specially developed for this purpose, will make these parts good as new. Such a protective Coast Metals overlay offers these features:

High resistance to thermal stresses.

Ability to withstand repeated impact at elevated temperatures.

No corrosive effect from superheated steam.

Excellent welding characteristics,—permitting successful application on such base metals as monel, 25.20 chromium nickel, carbon molybdenum steel *without porosity, checks or blemishes.*

Perfect machineability with Carboloy tool,—reducing machining costs often as much as 30%.

Coast Metals Hard-Facing is today's answer also for solving other maintenance problems in the reclamation of worn parts, equipment and machinery. Helpful literature gives full details. Write for this today,—also tell us *your* particular wear-resistance problems.

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Plant and General Offices: 1232 Camden Ave., S. W., Canton 6, Ohio

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COAST METALS *hard-facing weld rods*

MAKE YOUR EQUIPMENT LAST LONGER

tuminous mine employment since 1902 and the lowest anthracite since the 1870's.

"Manpower shortage figures are based on minimum current needs and are far less than the net loss of men to the mining industry. Actually, mine operators are seeking nearly double the number of men represented by the shortage figures.

Estimated manpower shortage by the critical areas are:

Southern Appalachian bituminous fields (Districts Nos. 7 and 8) in southern West Virginia, Virginia, eastern Kentucky and Tennessee—13,750 men.
Western Pennsylvania bituminous (District No. 2)—6500 men.
Alabama (District No. 13)—700 men.
Michigan (District No. 5)—250 men.
Arkansas (District No. 14)—600 men.
Western and southern Colorado and northern New Mexico (District No. 17)—900 men.
New Mexico, Arizona and California (District No. 18)—300 men.
Wyoming and Idaho (District No. 19)—900 men.
Utah (District No. 20)—400 men.
Washington, Oregon and Alaska (District No. 23)—700 men.
Anthracite mines in Pennsylvania—7500 men.

Government Article Suggests Renting War Plants to Producers

Washington

• • • **The possibility that large war plants may be converted into industrial centers where several independent manufacturers may rent as much partitioned off space as they could use is discussed in an article in *Domestic Commerce*, publication of the Department of Commerce.**

It points out that the principle of sharing a building, tools, materials and even labor in manufacturing dissimilar goods for sale or barter is not new, but is as old as commerce.

"The experience of 'loft-buildings' alone cannot yield enough clues to a successful operation of large converted war plants," says the article. "Larger precedents in 'multiple rental' operations must be examined. Of these there are several, both in this country and abroad. They fall into different classes."

One class of large multiple rental plants is conceived of as a purely private enterprise. Such enterprises include the Bush Terminal Buildings Co. and the New York Dock Trade Facilities Building, both in Brooklyn, the Starrett-Lehigh Building in New York City, the Chicago Central Manufacturing District, the Santa Fe Industrial Building in Dallas, Texas, and the P-V Atlas Industrial City in Milwaukee, Wis.

Another class of multiple-tenancy enterprises is that of publicly financed plants sponsored by municipalities,

THESE are cylinders. These are beginnings—the start of a mightier machine than even war built. For it was the American Machine of Industry that built the American Machine of War—and its greatest job will be tomorrow: building a new world of Peace and Prosperity. It will be the most gigantic task man ever faced and it is as important in its details as in its conception.

The four plants of The Weatherhead Company have produced industrial parts such as these at the rate of millions every week. When Peace is restored we will continue to make cylinders—and scores of other industrial necessities—as our part in the rebuilding of tomorrow's great peacetime world.

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND 8, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries

Plants: Cleveland, Columbia City, Ind., Los Angeles
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Beginnings OF TOMORROW'S WORLD!

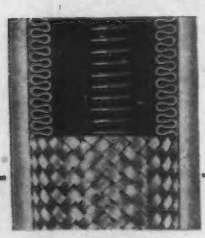
FREE: *Write on company letterhead for "Seeds of Industry"—a history of The Weatherhead Company, its facilities and products.*

REX-WELD combines 8 other advantages with MAXIMUM FLEXIBILITY

REX-WELD is preferred by many designers and manufacturers. Because of its satisfactory performance under difficult conditions for long periods of time, maintenance requirements are reduced to a minimum.

In addition to providing maximum flexibility, REX-WELD is highly resistant to fatigue, handles burst pressures to 14,500 p.s.i. and temperatures to 1000° F., remains air-tight longer, is leakproof even after hard usage, can be used for liquids that are searching and will withstand prolonged flexing.

Chicago Metal Hose Corporation manufactures a type of flexible tubing to meet every requirement. Our engineers will be glad to recommend the type best suited to meet your particular requirements. Write for catalog and complete information.



REX-WELD CORRUGATED FLEXIBLE METAL HOSE

Flexible Metal Hose for Every Industrial Use

CMH CHICAGO METAL HOSE CORPORATION
MAYWOOD, ILLINOIS
Plants: Maywood and Elgin, Ill.

designed to promote the coordination of special locally available transportation and marketing facilities in the interest of the business community as a whole. Examples of this type are the 15-story Port Authority Commerce Building in New York City, where a manufacturer can rent up to 165,000 sq. ft. of floor space on a single floor, and the Port of Newark Development in New Jersey, where a number of factory buildings and warehouses are spread over 1500 acres.

Machinery and Allied Products Institute Elects New Members

Washington

• • • **New members recently** elected to the executive committee of the Machinery and Allied Products Institute are:

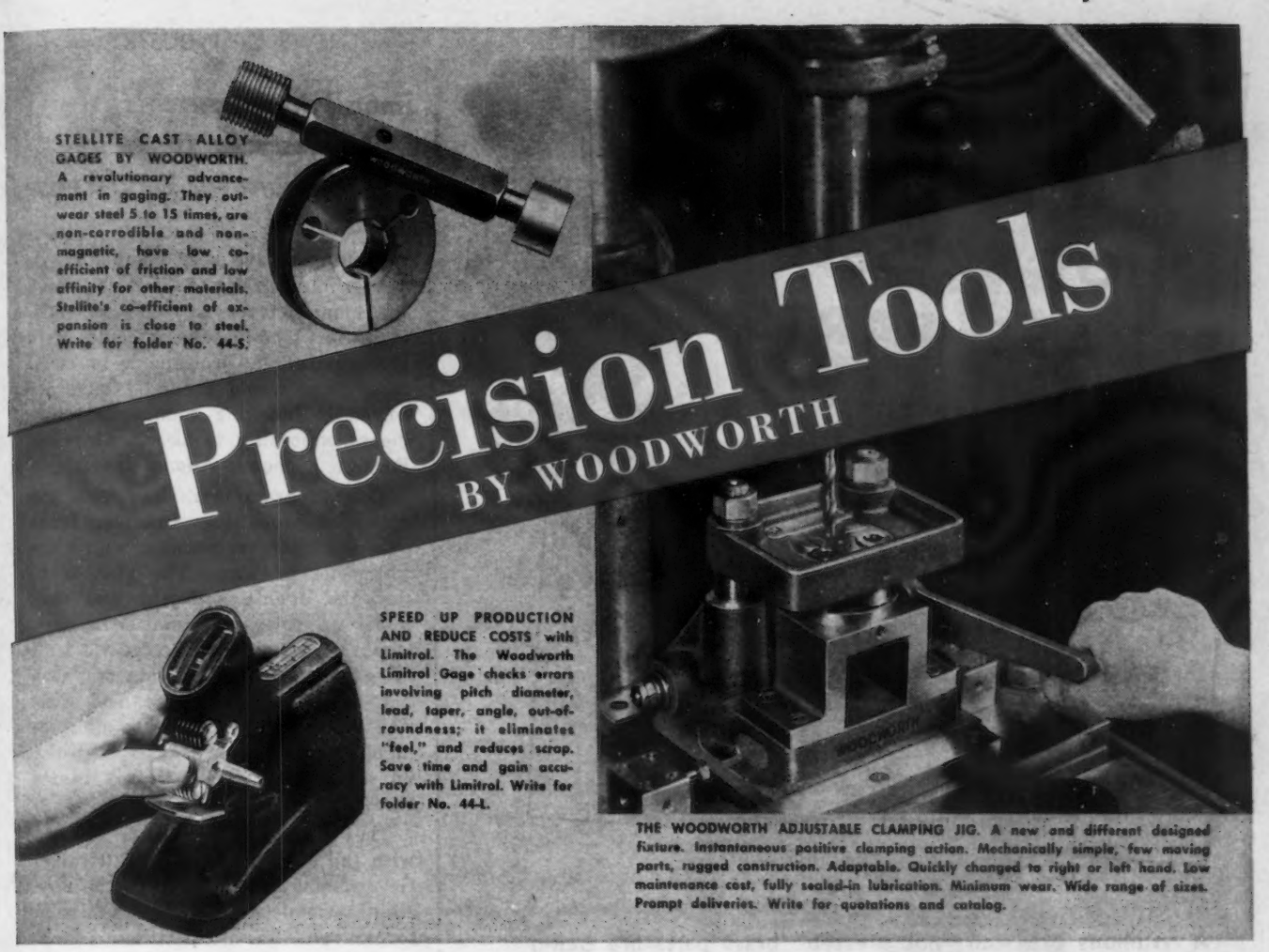
John W. Haddock, president, Farrel-Birmingham Co., Inc., Ansonia, Conn.; R. E. LeBlond, president, The R. K. LeBlond Machine Tool Co., Cincinnati; Gordon Lefebvre, president, the Cooper-Bessemer Corp., Mt. Vernon, O.; James Y. Scott, president, Van Norman Co., Springfield, Mass.; George P. Torrence, president, The Cleveland Pneumatic Tool Co., Cleveland.

Members reelected to the executive committee are:

Charles E. Brinley, chairman, The Baldwin Locomotive Works, Philadelphia; Maurice F. Dunne, president, Pyott Foundry & Machine Co., Chicago; Frank W. England, executive vice-president, Illinois Tool Works, Chicago; Duncan W. Fraser, president, American Locomotive Co., New York; Robert E. Friend, president, Nordberg Mfg. Co., Milwaukee, Wis.; Robert W. Gillispie, president, The Jeffrey Mfg. Co., Columbus; George H. Houston, Houston & Jolles, New York; L. W. Mesta, executive vice-president, Mesta Machine Co., Pittsburgh; Philip M. Morgan, president, Morgan Construction Co., Worcester, Mass.; Guy A. Wainwright, president, Diamond Chain & Mfg. Co., Indianapolis, Ind.

The Institute also elected the following to advisory committee:

H. C. Beaver, president, Worthington Pump & Machinery Corp., Harrison, N. J.; Ralph E. Flanders, president, Jones & Lamson Machine Corp., Springfield, Vt.; Robert M. Gaylord, president, The Ingersoll Milling Machine Co., Rockford, Ill.; John W. O'Leary, Chicago; and Herbert L. Watson, president, DeLaval Steam Turbine Co., Trenton, N. J.


STELLITE CAST ALLOY GAGES BY WOODWORTH. A revolutionary advancement in gaging. They outwear steel 5 to 15 times, are non-corrodible and non-magnetic, have low co-efficient of friction and low affinity for other materials. Stellite's co-efficient of expansion is close to steel. Write for folder No. 44-S.
Precision Tools
BY WOODWORTH
SPEED UP PRODUCTION AND REDUCE COSTS with Limitrol. The Woodworth Limitrol Gage checks errors involving pitch diameter, lead, taper, angle, out-of-roundness; it eliminates "feel," and reduces scrap. Save time and gain accuracy with Limitrol. Write for folder No. 44-L.
THE WOODWORTH ADJUSTABLE CLAMPING JIG. A new and different designed fixture. Instantaneous positive clamping action. Mechanically simple, few moving parts, rugged construction. Adaptable. Quickly changed to right or left hand. Low maintenance cost, fully sealed-in lubrication. Minimum wear. Wide range of sizes. Prompt deliveries. Write for quotations and catalog.

Designed by Tool Engineers for Tool Engineers

The N. A. Woodworth Company is an organization of tool engineers and craftsmen dedicated to creating and producing the ultimate in precision tools . . . backed by years of training and experience plus their most modern metallurgical laboratories and experimental departments. Woodworth tool engineers design and produce tools of accuracy and long life that reduce production costs.

It was the metallurgists and tool engineers of the N. A. Woodworth Company, collaborating with the Stellite Company, who developed the now famous Stellite Cast Alloy for the manufacture of gages.

Another great achievement is the Limitrol Gage with its wide range of applications and possibilities.

Now the new Woodworth Adjustable Clamping Jig joins the *WOODWORTH FAMILY,* which has done so much to increase production and reduce costs for industry.

These contributions to the Manufacturers of America, together with a reputation for reliable service, have established The N. A. Woodworth Company as a leader in the tool industry.

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WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

TITAN

"HOT PRESSED" BRASS PARTS

★ Millions of Titan "hot pressed" brass parts are being forged today for use in the valvular control systems of our submarines and other naval craft.

Because of their improved physical properties, excellent surface conditions, close tolerances and freedom from porosity, Titan "hot pressed" brass parts are performing a noteworthy service in many important war applications in these crucial days.

By applying these "hot pressed" brass parts to many vital jobs for which they had not previously been used, additional knowledge has been gained which will be of outstanding economical benefit and available to manufacturers of refrigerators, plumbing supplies, gas stoves and other domestic appliances when the war ends.

In Your Post-War Planning, Don't Overlook the Economies of Titan "Hot Pressed" Brass Parts.

Titan

METAL MANUFACTURING CO., BELLEFONTE, PA.
NEW YORK • CHICAGO • SAN FRANCISCO

Quality Alloys By Brass Specialists
Brass and Bronze Rod • Forgings • Die Castings • Welding Rods

Small Tools Agents In Australia to Be Paid for Lend-Lease

New York

• • • Plans have been completed for agents in Australia of American small tool manufacturers to receive commissions for lend-lease shipments from the Australian Government to equal those they would normally have received in handling commercial shipments, according to Leo T. Crowley, Foreign Economic Administrator.

This program is in line with the policy of protecting American trade channels wherever possible, within the exigencies of war. The plan is to pay the agents sufficient and thus make up for the commissions they would normally have received in handling commercial shipments but have not received in handling lend-lease. The compensation relates to all shipments of small tools sent to Australia on lend-lease by the United States since March 11, 1941.

The agreement has been effected with the assistance of the Australian Government and the chief of the Foreign Economic Administration mission to Australia. The Association of U. S. Manufacturers Representatives in Australia, to which nearly all representatives in that country belong, have agreed to the plan.

The plan provides for payment of full percentage of commissions on the amounts established as normal pre-lend-lease annual shipments, with further provisions made for smaller commissions on shipments over and above the amounts so established. A somewhat similar arrangement has been made for payment of compensation to Australian agents of American machine tool manufacturers and has been accepted by substantially all of the agents involved. The formula in the case of machine tools calls for compensation on a sliding scale of percentages.

New OPA Special Counsel

Washington

• • • Administrator Chester Bowles has announced that Max Swiren of Chicago has been retained by OPA as special counsel in the railroad freight rate restoration proceedings shortly to be heard by ICC. Mr. Swiren, a partner in the Chicago law firm of Levinson, Becker, Peebles and Swiren, served as OPA counsel in the 1943 proceedings.

Gets into tight spots!

LOOK at that O.D., and you'll know why Apex stud setters get into hard-to-reach places with such ease and precision—even in the hands of semi-skilled workers. These simple, trim, clean-cut stud setters have small body diameters for their capacities. They are extremely easy to adjust for length of thread on stud and maintain proper adjustment in service. Simple design plus ample ruggedness and toughness make them fine tools for either hand or power applications. Four different sizes will set studs up to 1¼". You can get them with Morse taper, hexagon, T-handle and male or female square drive shanks, or combination T-handle with female square for use with a torque wrench. Write for Bulletin No. 101 for all the facts.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Tools for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

The handling of materials in sheet form—particularly if sheets are large and unwieldy, can best be accomplished by power industrial trucks. Case histories listed below, taken from the new Baker Catalog and showing how Baker Trucks are efficiently performing this operation for others, may suggest the answer to your problem.

★ ★ ★

Paper mills, box board manufacturers and other paper converters are using Baker Trucks to good advantage for transporting, storing, loading and unloading paper in large packages of sheets and rolls. Often sheets are strapped to skids at the mill, and these "unit packages" are kept intact until they reach their destination. (Left) One mill reports savings up to 80% in paper handling costs.

Baker Fork Trucks are used extensively to eliminate individual handling of sheet steel in steel mills and fabricating plants. In addition to saving man hours and speeding movement, these trucks conserve warehouse space by tiering skid loads of sheets two and three high. (Right) Savings in sheet steel handling run as high as 87%.

To meet the demand for an efficient method of loading and unloading the large sheets of steel used for automobile bodies, Baker engineers developed the Baker Articulated Sheet Handler. This truck handles sheets up to 48" x 144" in packages weighing up to ten tons, loading 200 tons per hour at gross savings of $4.30 per ton. (Left)

A leading producer of wall board for prefabricated homes found Baker Low-Lift Trucks ideal for handling large quantities of 8 x 14 ft. panels. Besides effecting substantial savings in handling costs, this company conserves manpower and minimizes damage to material transported. (Right)

The world's largest manufacturer of domestic ranges uses a fleet of 8 Baker Hy-Lift Trucks for handling the tons of steel sheets consumed daily. On one operation, (illustrated, left) carrying sheets from shearing department to stamping presses, costs were reduced from 14c to 1.6c per ton. Overall savings in handling costs were reduced 75% over former methods.

A Baker Fork Truck cut time required for handling rubber sheets 50% at a large rubber plant. Actual savings had paid for the truck eight months after it was placed in service. The heavy rubber sheets are placed on pallets, facilitating transportation, storage and car loading. (Right)

WRITE FOR YOUR COPY

Plant and production managers, traffic managers, superintendents, purchasing agents and any others concerned with material handling will find the new Baker Catalog No. 52 a valuable reference.

BAKER INDUSTRIAL TRUCK DIVISION
of The Baker-Raulang Company
2175 WEST 25th STREET • CLEVELAND, OHIO
In Canada: Railway and Power Engineering Corporation, Ltd.

Baker INDUSTRIAL TRUCKS

New Increases For Power Crane Castings Announced by OPA

Washington

• • • **Increases of** six per cent in the ceiling prices of power shovel and locomotive crane castings, with the exception of shoes and treads, and of 17 per cent for railroad dump car and tank car castings were announced recently by OPA. The increases were effective on October 9. OPA said they were granted to help insure continued production of power, shovel and locomotive crane castings and to bring railroad dump car and tank car castings into line with a general increase in ceilings of miscellaneous freight car castings granted Jan. 15. At the same time, a probable slight increase in returns to producers of steel castings was provided where short orders of castings, not exceeding 200 lb. are filled. Now ceilings were provided for these sales, with a $10 permissible minimum price established. These sales were said to represent less than 1 per cent of the industry's tonnage.

Provision also was made for higher maximum prices for quantities of 1000 or more railroad ballast car castings by the institution of a new quantity differential. OPA said that it was found that the general 17 per cent increase in ceilings for railroad ballast car castings granted in January, 1944, did not actually result in a 17 per cent increase on quantities of 1000 and more.

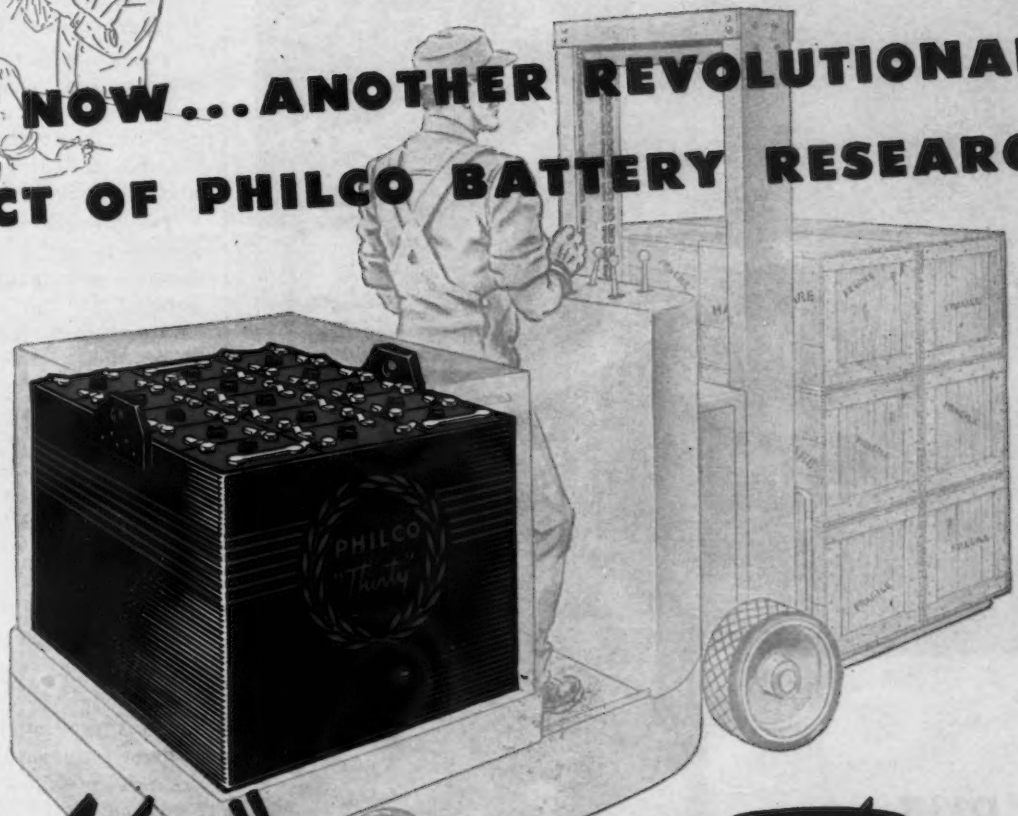
The general basis for quantity also was altered, which may result in lower maximum prices. This change will affect only a few producers. It provides that the quantity differentials will be based upon the quantities ordered from one pattern by the same purchaser "prior to the commencement of production" rather than on the basis of quantities ordered from one pattern "at one time."

Other changes, generally dealing with procedure and clarification, are:

The practice previously followed by interpretation of establishing maximum prices on castings not subject to repair by the producer is now expressly written into the regulation. This practice calls for applications to OPA for approval of special maximum prices on the Form 141:4 procedure.

Sellers are permitted to request individual adjustments on a compensa-

NOW...ANOTHER REVOLUTIONARY PRODUCT OF PHILCO BATTERY RESEARCH!

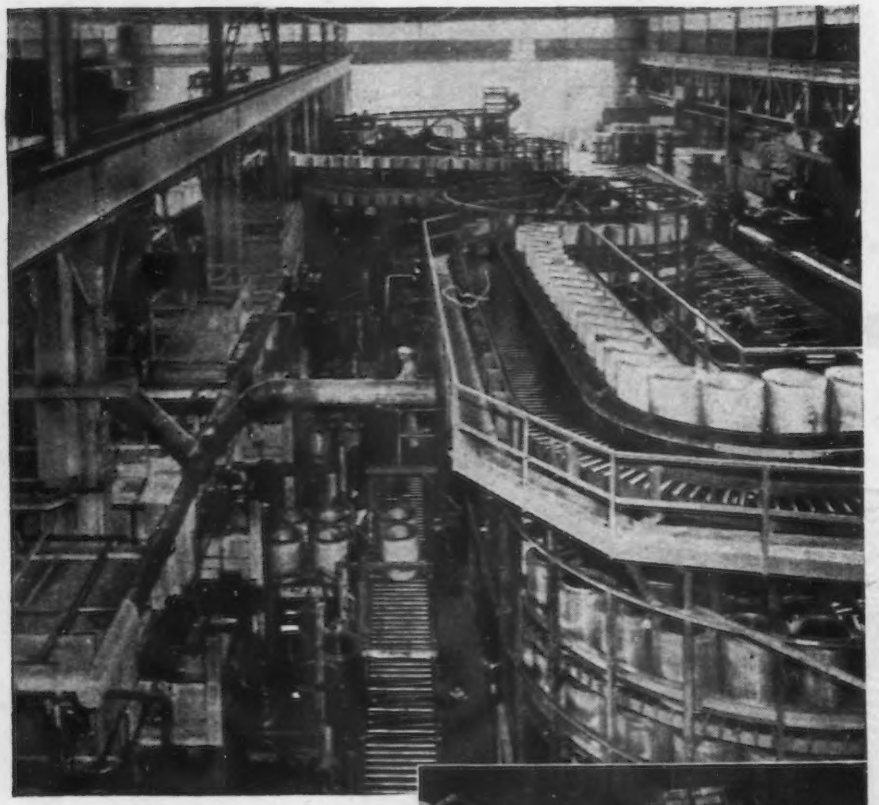


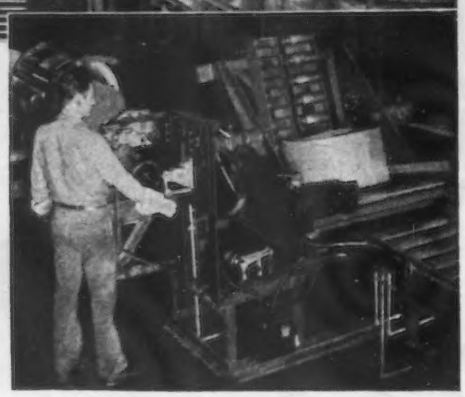
The New "PHILCO Thirty" gives 30% Longer Life

A few months back Philco pioneering gave industry the outstanding development in stationary batteries—Philco Vitrabloc. Today, Philco engineering research scores again—with the top advance in motive power batteries—the new "Philco Thirty." With 30% longer life, and *more*—with new economy in maintenance and lower depreciation—here is headline battery news. Here, for the first time in any battery, is a revolutionary new principle of fabricated insulation—developed, proved and backed by Philco. Here, too, is that famous 10% extra work capacity made possible by Philco's modern plate design. Ready today, is this great new post-war battery—the new "Philco Thirty"—now available in certain types and limited quantities. Write for full information.

PHILCO CORPORATION, *Storage Battery Division, Trenton 7, New Jersey*

For 50 Years a Leader in Industrial Storage Battery Development





PUT MATHEWS METHODS INTO YOUR POST-WAR PLANS

The need for special devices in conveying systems, increased during these war years of fast and tremendous production, has found Mathews Engineering ready and eager for the job. Frequently, the conveying problems have been entirely new. Always, they have been different in some respects from even the most similar jobs in the past. The conveyers were needed quickly and the need was great. To meet this need, Mathews Engineers and production personnel have hammered away steadily, meeting these problems as they came, and solving them. As a result of this activity — these new problems — these special devices which were developed — many years of experience have been packed into a short while. That is why Mathews methods are up to the minute. This experience is available, through the Mathews Field Engineer, in all principal cities in the United States and Canada.

Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA

tory basis, by which a reduction will be made in prices of other products to equal the total dollar amount of the particular increase sought.

The amount of freight producers are required to absorb is clarified by the insertion of a provision that the producer must absorb the lowest applicable rail charges, but, in no event, more than 50c. per 100 lb.

The practice previously allowed by interpretation in connection with adjustable pricing of castings is incorporated in the regulation. Under this practice, which is in Procedural Regulation 6, a seller may, upon the filing of an application for adjustment or five days prior to that time, contract or agree with his customers that the price being charged on deliveries thereafter may be raised to the level established by OPA in acting on the application.

Definitions of "armor," "navy," "ordnance," and "ship and marine" castings have been written into the regulation to avoid constantly recurring boarderline situations on pricing.

Two typographical errors in the ceilings for miscellaneous freight car castings as established Jan. 15, are corrected.

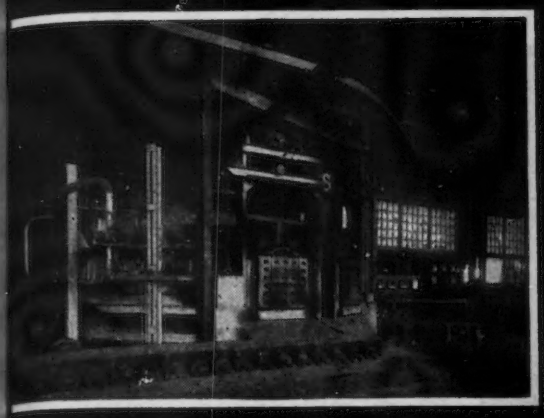
Baldwin to Show Dynamic Test Devices at Metals Show

Philadelphia

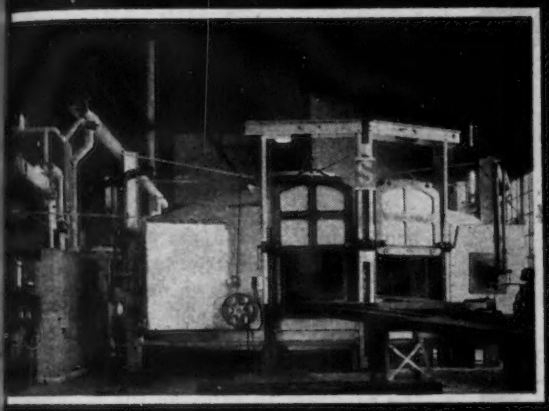
• • • A series of new devices for dynamic testing of materials were to be unveiled at the Cleveland Metals Show by the Southwark testing machine division of the Baldwin Locomotive Works.

At the metals show the Baldwin group has planned an elaborate showing of the latest mechanical and electronic aids for precision testing of metals, plastics and other materials used in aircraft production and other lines of manufacture. Going far beyond the usual static testing of materials, these machines reveal how dynamic testing can prove materials by simulating service and therefore give full details on how the materials stand up in daily use.

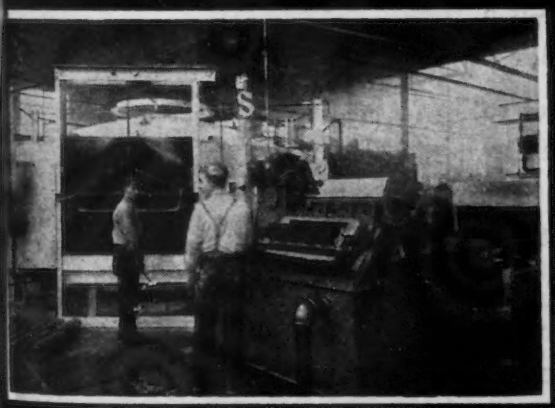
While the war and the demand for new warplanes has accelerated interest in dynamic testing, the advantages are by no means limited to this field, since every industry faces the problem of making of new products using new materials — calling for higher standards in testing than industry ever before has achieved.



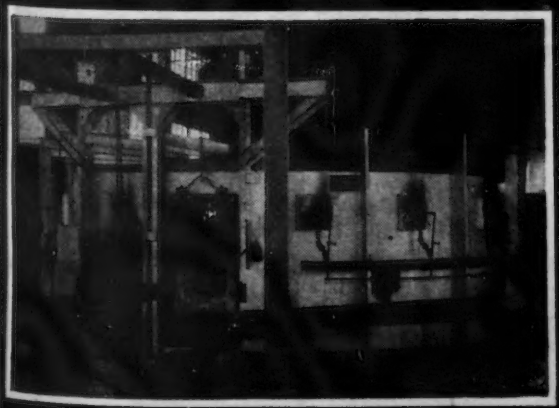
This type of Salem furnace not only gives you very close control of the heating rate, but also of the atmosphere. Pictured above is a furnace used to heat treat high carbon and alloy steels.



Here splice bar plates receive heat treatment of 1750° F. but the furnace can operate at 2000° F. . . . faster, more economical than pusher type.



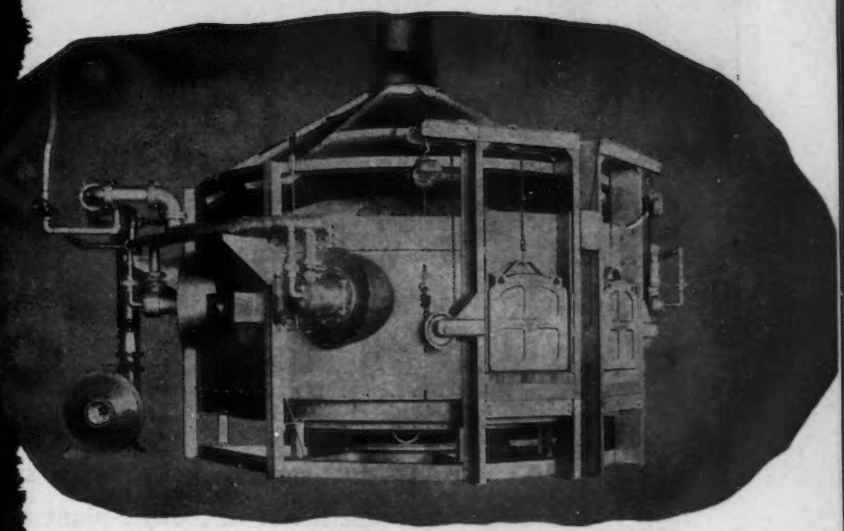
This furnace above operates at 1500° F. to harden coil springs. Rods are heated in a roll down furnace, then the coils are moved to this Salem rotary.



Above, shell forgings are heated to 1500° F. for the hardening quench then temperature is lowered to 1250° F. for the drawing operation. Special hearth cradles the shells.

SALEM'S INGENUITY

MAKES A GREAT DIFFERENCE



Every Salem rotary furnace is tailor-made and co-ordinated with your production lines. Salem will also design and build your handling mechanism—in short, Salem Engineering Company will do the ENTIRE job for you, whether it be one of speeding war production or a problem of converting to your civilian products.

As builders of the world's largest rotary furnace, Salem has the experience and ingenuity to give you rotary furnaces with the following worth-while advantages:

1—A self-emptying hearth when compared with the pusher type furnaces,

2—Small openings to conserve more fuel,

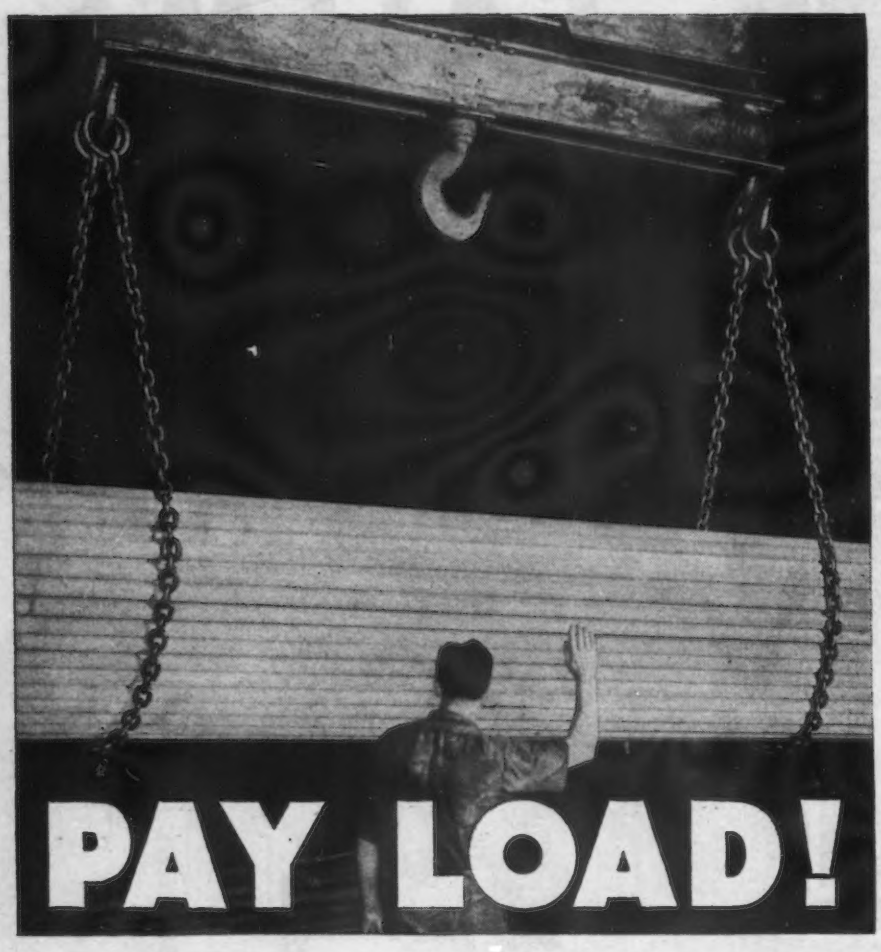
3—Uninterrupted hearth movement so material is never exposed to direct flame for over a few seconds,

4—Ideal loading and heating conditions,

5—Economy, low maintenance, low fuel cost, high production.

SALEM ENGINEERING COMPANY

SALEM ENGINEERING CO.
SALEM, OHIO



PAY LOAD—full capacity with entire safety—is a mighty important factor in today's plant activities.

So the demand for AMERICAN CHAIN continues to grow. For men say, "You can depend on AMERICAN CHAIN, that's for sure!" You'll readily find the right AMERICAN CHAIN for each job—the correct material and type. Choose sling chains with particular care.

This means that you substitute confidence for doubts and certainty for worries. You swing the old production curve steadily upward. Did you ever study the production curve in one of your departments for days following an accident?

In placing orders please give highest possible preference ratings.

AMERICAN CHAIN DIVISION

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AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT • CONNECTICUT

In Business for Your Safety

Standard Forms Are Now Available For Termination Contracts

Washington

• • • **Replacing forms** previously issued by the War and Navy Departments, standard forms to be used for the settlement of terminated fixed-price (lump sum) supply contracts were made available for distribution on Oct. 10. Robert H. Hinckley, Director of the Office of Contract Settlement, said that the new forms had been approved by all government agencies concerned and may be obtained from any government contract agency, such as the procurement services of the armed forces and the Maritime Commission at their local offices throughout the country.

Adoption of the uniform simplified proposals for fixed price war supply contracts, the director said, will speed the settlement of terminated war contracts.

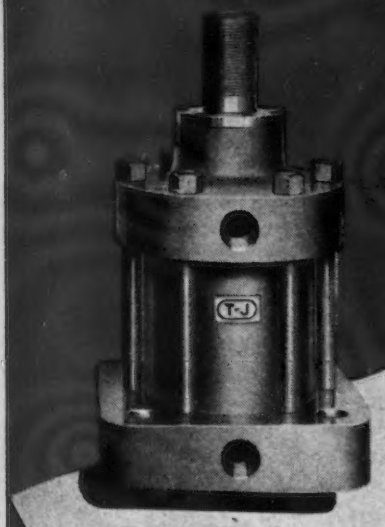
The adoption of new standard settlement forms is the eighth step in the program to expedite the termination of war contracts, under the Contract Settlement Act of 1944. It follows closely on announcements of T-loans for interim financing of terminated war contracts, provision for partial payments to war contractors with terminated contracts, provision for pre-termination agreements, plant clearance and property disposal, and three other regulations designed to speed the settlement process.

The standard contract settlement proposal form provides for filling of practically any type of inventory claim and also allows for progressive inventory report. Exceptions are taken care of by Form 1-a for use when the contractor proposes to dispose or retain all inventory allocable to the terminated portion of the contract and the net amount of the proposed settlement is less than $1,000; and Form 1-b for use for settlement proposal on total cost basis. Forms for inventory schedules are provided as follows:

Metals (in mill product form), Form 2a; Raw materials (other than metals) purchased parts, finished components, finished product and miscellaneous (including perishable tools), Form 2b; work-in-process, Form 2c; and tools, dies, jigs, fixtures, etc. (not including perishable tools), Form 2d. In cases where substantiating accounting data is required, a schedule of acounting information (Form 3) is available.

MOVE "MOUNTAINS or MOLE HILLS"

IN ANY DIRECTION



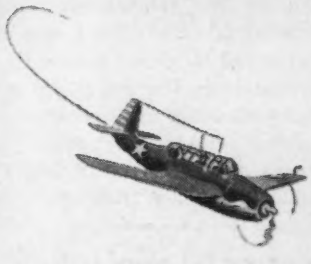
Here's *efficient power movement* to help you get maximum speed in your production... use T-J Air and Hydraulic Cylinders! Apply a T-J Cylinder to eliminate muscular effort or to simplify mechanical movements—the ideal way to clamp, press, raise or shift in any direction! Built in many styles, sizes and strokes to meet your requirements... exerting power movement of 100 lbs. to 12,000 lbs. (direct) with T-J Air Cylinders... 1000 lbs. to 50,000 lbs. (direct) with T-J Hydraulic Cylinders. Easily and quickly installed. Write for latest catalogs.

FOR TOUGH JOBS SPECIFY

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

T-J

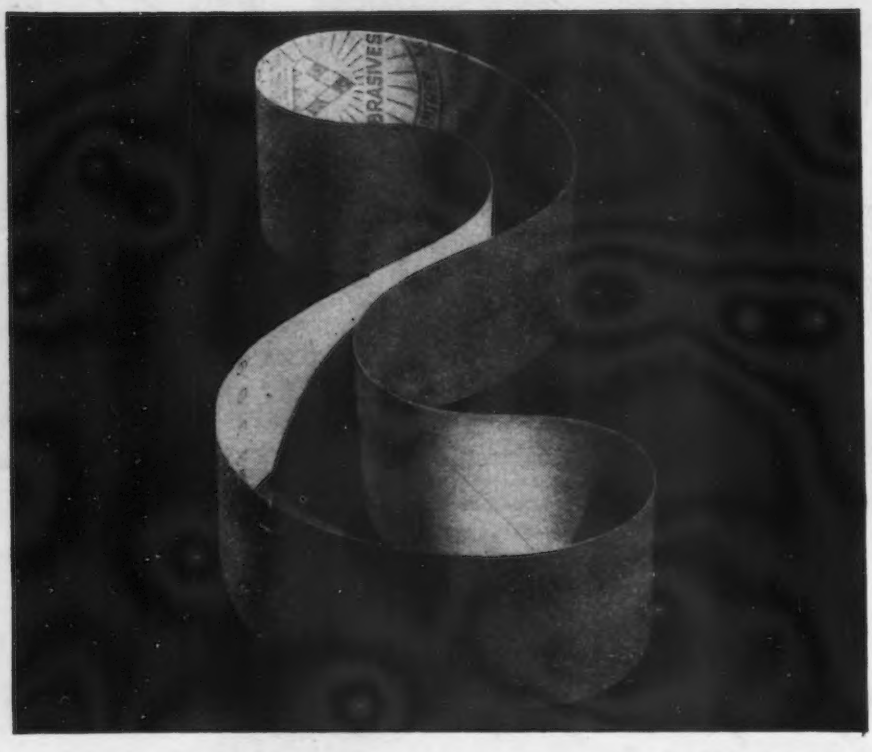


"Rev'up"

AIRCRAFT RIVETING THE RIVITOR WAY

● T-J Air Powered RIVITOR brings speedy automatic feed riveting to aircraft production! Designed to handle exclusively aircraft (aluminum alloy) riveting... Production on the Rivitor depends on the individual application and requires no manual rivet handling. Operates with Air Squeeze action ...cost-cutting efficiency. Soundly engineered, sturdily built. On today's tough production lines, *T-J gets the O.K.!* Write for bulletin. The Tomkins-Johnson Co., Jackson, Michigan.

Because they're insulated to withstand grinding temperatures as high as 1700°, Silver Streak Metal Working Cloth Belts stay cool . . . Because they stay cool, fine-grit SILVER STREAK Belts cut faster . . . cut cleaner . . . last longer than hot-running, non-insulated belts.



In spite of these three big advantages, insulated SILVER STREAK Belts don't cost a penny more than ordinary aluminum oxide belts. Reason enough for switching to Silver Streak Belts NOW!

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Abrasive Products, Inc.

SOUTH BRAINTREE 85, MASSACHUSETTS

JEWELOX • JEWEL EMERY • JEWEL GARNET • JEWELITE • JEWEL FLINT • NEW PROCESS

American Welding Society Spelldown Matches Auto Firms

Detroit

• • • A welding spelldown featured the second meeting of the 1944-45 season of the Detroit section at the Hotel Fort Shelby, Oct. 6. A team of three experts representing Ford were adjudged first over teams from Chrysler and General Motors, as gauged by an applause meter recording audience reaction to answers.

The Ford team consisted of E. C. White, H. Tromans and M. Cascioli. The Chrysler team included H. R. Sparks, H. Muhrlein and X. DeSosta. General Motors was represented by Stuart Spice, Robert Allan and J. Hassler.

Questions ran the gamut all the way from welding history to highly advanced current day techniques. Questions were supplied in advance by members of the Detroit section.

Meanwhile, the Flint Division of the section met the same evening at Frankenmuth to hear a paper by W. E. Whitehouse of Defoe Shipbuilding Co., Bay City, Michigan, who described the technology of welding large boat structures upside down. Advantages in the upside down method were listed by Mr. Whitehouse as including much greater speed, use of less experienced welders because the work was mainly in the downhand position, and maintenance of dimensions to considerably closer tolerances. Motion pictures of work done in Defoe yards emphasized Mr. Whitehouse's talk.

Contract Termination In Cleveland Announced

Detroit

• • • **Termination of a** Cleveland contract of Fisher Body Division to make P-75 fighter planes was announced recently by the Central Aircraft Procurement District headquarters.

The cancellation of the contract was said to be the result of "changes in military requirements reducing the immediate need for quantity production of the P-75. Output of the new planes, long range fighters, has been in progress for several months at the Cleveland Aircraft Division of Fisher Body. The statement said other high priority Air Forces work would be assigned to the plant absorbing many workers and that others would be transferred to production of B-29 superfortress parts.

AMERICA'S OLDEST, LARGEST, AND ONLY CRANE BUILDER
PRODUCING COMPLETE ELECTRICAL CRANE EQUIPMENT

P&H
OVERHEAD CRANES

"THE WAR ISN'T WON YET!"

There's still a big job ahead . . . with fewer men to do it. It means organizing our production now . . . to maintain a swift and steady flow of materials. Overhead cranes, where needed, will help us to deliver more efficiently on war contracts. And when that job is done, they'll help us cut peacetime manufacturing costs.

☆ ☆ ☆

At P&H, we like to do business with crane buyers who think in terms of sound values and bigger returns on investments. It makes our job a lot easier. And being America's *oldest, largest, and only* crane builders producing complete electrical crane equipment, we have just what they want and need.

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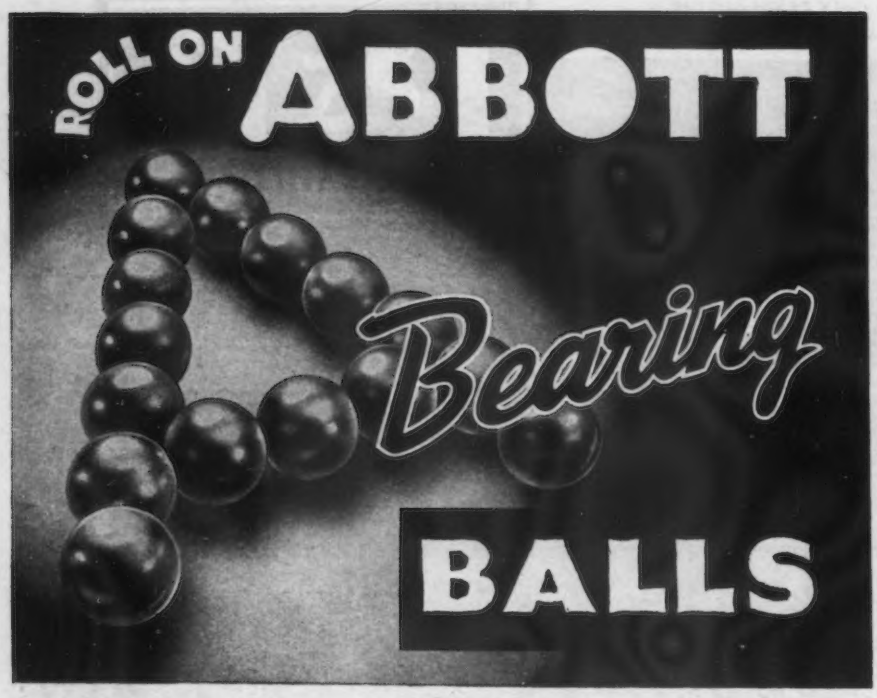
CORPORATION
ELECTRIC CRANES • EXCAVATORS • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS



the BURDEN *rests on them!*

Get acquainted with these mighty mites and recognize their importance!

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The daily performance of BEARING BALLS—the "working parts" of your assemblies—is worthy of your serious consideration. The weight of the burden rests solidly on BEARING BALLS yet they complain not nor cry-out because of "overwork." In many load carrying jobs "rest periods" are unknown to BEARING BALLS.

•

Consider the tremendous contribution BEARING BALLS are making to war-time production—ABBOTT is proud to share in that responsibility. Today, as always, ABBOTT BEARING BALLS are "carrying the load as planned". For uninterrupted performance specify "ABBOTT".

ABBOTT'S (A) 35th YEAR

ROLL ON ABBOTT Bearing BALLS

THE ABBOTT BALL COMPANY HARTFORD 10, CONN. U.S.A.

Conservation of Used Bearings From Planes Subject of Meeting

New Britain, Conn.

• • • **Plans for the** conservation of millions of anti-friction ball and roller bearings by the Army Air Corps were initiated recently with the opening here of a week's technical symposium of Army representatives and industrial production engineers.

Lieut. K. M. Glasener, of the Army Technical Service Command, in opening the study said, "This is the first attempt on the part of the fighting services or of industry to put back to work the many tons of bearings that because of their fine precision quality have been idle after planes are dismantled."

"Since all types of military aircraft must be taken down and inspected after a certain number of flying hours, a large pool of still serviceable bearings today is on hand in the Army's 12 service depots that can be reused with the same resultant high performance efficiency if properly handled. Today the depots are reservicing some 36,000 bearings daily, many of them sent back from overseas.

"Bearings are the most exacting precision equipment turned out in mass production by industry and at the week-long session, engineers, metallurgists, and inspection experts will discuss the cleaning, inspection and lubrication of bearings with the Army representatives from each of the 12 depots, while Army inspectors will transmit to industry knowledge gained from field experience."

U. S. Steel Shipments Set High Last Month

New York

• • • **Shipments of finished** steel products by subsidiary companies of U. S. Steel Corporation for the month of September and first nine months of 1944 were the highest on record for their respective periods. Shipments for the month amounted to 1,733,602 net tons.

The September shipments compare with 1,743,485 net tons in August, a decrease of 9883 net tons, and with 1,664,577 net tons in the corresponding month in September, 1943, an increase of 69,025 net tons.

The nine months' shipments of 15,864,466 net tons compare with 15,069,644 net tons in the same period of 1943, an increase of 794,822 net tons.

Your Never-Failing Source of Quality Electrodes for Every Type of Weld

The reasons for the superior performance of Reid-Avery Electrodes can be stated simply and briefly: Twenty-five years' experience, the best and most modern equipment plus skilled craftsmanship constantly guided by advanced laboratory procedure. • It is under such favorable conditions that each of the following complete list of Reid-Avery Electrodes is produced.

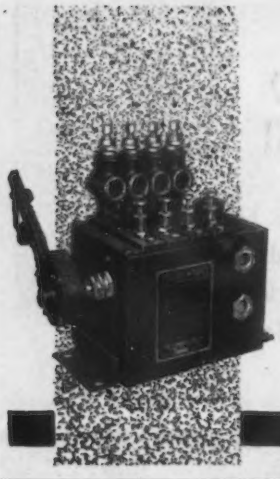
ELECTRODE	A.W.S. CLASSIFICATION	MATERIAL TO BE WELDED	TYPE OF WORK	CURRENT
RACO 7	E-6010	Mild Steel	All Position	Rev. Pol.
RACO 11	E-6011	Mild Steel	All Position	A.C.
RACO 8	E-6012	Mild Steel	General Purpose Poor Fit-up	Str. Pol. or A.C.
RACO 8	E-6013	Mild Steel	General Purpose Light Gauge	Str. Pol. or A.C.
RACO 6	E-6020 E-6030	Mild Steel	Butts, Positioned Fillets and Deep Grooves	A.C. or D.C.
RACO 20	E-6020 E-6030	Mild Steel	Single Pass Fillets or Grooves	A.C. or D.C.
RACO 5	E-6030	Mild Steel	Deep Grooves	A.C. or D.C.
RACO 82	None	Steel	All Position Wear-resisting Machinable	Str. Pol. or A.C.
RACO 74	E-7010	High Strength Steels	All Position	Rev. Pol.
RACO 64	E-7020	High Strength and	Butts, Positioned Fillets and Deep Grooves	A.C. or D.C.
RACO 13	E-7030 E-6013	Silicon-killed Steels Mild Steel	General Purpose Poor Fit-up	A.C. or D.C.
TYPE D	E-4511 E-4521	Mild Steel	Automatic or Manual	Str. Pol.
TYPE D 30-40 C	None	Steel	Automatic or Manual, Wear-resisting Machinable	Str. Pol.
TYPE M	E-4511 E-4521	Mild Steel	Automatic or Manual	Str. Pol.
BLUE LABEL	E-4510 E-4520	Mild Steel	Manual	Str. Pol.
RACOLLOY 19-9	None	Stainless and Air-Hardening Steels	Welding and Surfacing	Rev. Pol. or A.C.
RACOLLOY 25-20	None	Stainless and Air-Hardening Steels	Welding and Surfacing	Rev. Pol. or A.C.

The

REID-AVERY COMPANY

DUNDALK BALTIMORE 22 MARYLAND

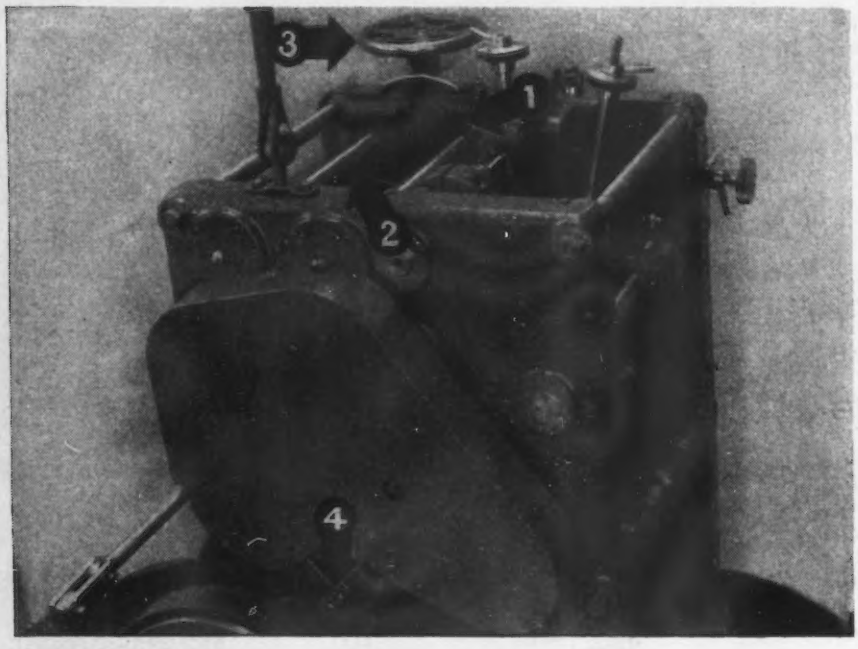
SINCE 1919 • PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS



TORRINGTON
Force Feed Mechanical
LUBRICATOR

Positive, never-failing force-feed bearing lubrication. Design flexibility also enables power takeoff from machine to front, rear, side or bottom by ratchet or rotary means. For complete information write, stating number of feeds and drive desired.

THE TORRINGTON
MANUFACTURING CO., TORRINGTON, CONN.



HELPS TO GREATER ACCURACY *in Spring Coiling*

No. 8 Preventive Maintenance

Preventive maintenance pays large dividends in accurate springs, lengthened machine life and freedom from lost production hours. Some of the most important points regarding preventive maintenance are reviewed here:

1. Anti-friction bearings should operate with a slight preload for maximum accuracy.
2. Roughness in feed roll shaft action affects wire feed and causes difficulty in maintaining diameter and free length of spring.
3. Excessive feed roll pressure may start fatigue cracks in feed roll shafts, eventually breaking one or more.
4. Crank gear "wobble" should be eliminated promptly. This may be done by taking up the bearing with the screw adjustment indicated in the photograph.
5. Poorly adjusted wire guides, contacting the feed rolls, cause excessive load on the machine and rapidly wear both guide and rolls.

   Block guides poorly adjusted, not reasonably snug to the arbor, will cause frequent arbor breakage.

November 16th—*Auxiliary Wire Feed Gears*

THE TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT

Rocket and Munitions Program Will Expand Existing Operations

Washington

• • • **Expansion of the rocket and heavy ammunition program of the Ordnance Department has necessitated construction of additions to existing munitions plants involving $150,000,000, the War Department announced.**

The new construction, authorized by the Construction Division, Office of the Chief of Engineers, is already more than one-third completed, with the remainder under way.

Construction authorized involves amounts ranging from $3,000 to one large project costing over $29,000,000, but every project is destined to play a part in furnishing our armed forces with greater quantities of ammunition and increased striking power.

While details of some of the projects cannot be revealed, it was disclosed that the largest of the jobs is at the Badger Ordnance Works at Baraboo, Wis. Others, with approximate amounts involved, are the Aberdeen Proving Ground, Aberdeen, Md., $3,000,000; Cherokee Ordnance Works, Danville, Pa., $3,000,000; Bluebonnet Ordnance Plant, McGregor, Tex., $3,000,000; Chevrolet Shell Plant, St. Louis, Mo., $3,000,000; Cornhusker Ordnance Plant, Grand Island, Neb., $3,000,000; Como Shell Plant, St. Paul, Minn., $2,000,000; Denver-Kaiser Shell Plant, Denver, Colo., $4,000,000; Elwood Ordnance Plant, Joliet, Ill., $2,000,000; Fontana-Kaiser Plant, Fontana, Cal., $3,000,000; Gopher Ordnance Works, Rosemont, Minn., $6,000,000; Gulf Ordnance Plant, Aberdeen, Miss., $2,000,000; International Harvester Shell Plant, New Brighton, Minn., $3,000,000; Johnstown Shell Forge Plant, Johnstown, Pa., $3,000,000.

Other large projects are at the Louisiana Ordnance Plant, Minden, La., $3,000,000; Morgantown Ordnance Works, Morgantown, W. Va., $3,000,000; New River Ordnance Plant, Pulaski, Va., $2,000,000; Pantex Ordnance Plant, Amarillo, Tex., $6,000,000; Radford Ordnance Works, Radford, Va., $2,000,000; Signal Battery Project, Milwaukee, Wis., $1,000,000; Sunflower Ordnance Works, Eudora, Kan., $19,000,000; Susquehanna Ordnance Depot, Williamsport, Pa., $3,000,000; U. S. Rubber Company Project, Lowell, Mass., $2,000,000; Victory Ordnance Plant, Decatur, Ill., $2,000,000; Weldon Spring Ordnance Works,

Arcos now offers with confidence Stainlend Electrodes for Alternating Current Welding (Equally satisfactory for direct current, reversed polarity).

Now available in these grades:

GRADE NAME	POPULAR NAME	TYPE No.
Stainlend K	19/9	308
Stainlend 19/9 CB	19/9 Cb	347
Stainlend HCN	25/20	310
Stainlend KMo	18/12 Mo	316
Stainlend HC	25/12	309
Stainlend 25/12 CB	25/12 Cb	309 Cb

If you require other grades for AC Welding, let us know. Contact your nearest distributor.

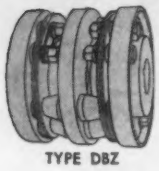
New Arcos *Electrode Specification Chart* gives useful information on all Arcos Ferritic, Non-Ferrous, and other special alloy electrodes.

ARCOS CORPORATION
401 NORTH BROAD ST., PHILADELPHIA 8, PA.

Distributors Warehouse Stocks in the Following Cities:

Baton Rouge, La.	Wm. D. Seymour Co.	Milwaukee, Wis.	Machinery & Welder Corp.
Borger, Texas	Hart Industrial Supply Co.	Moline, Ill.	Machinery & Welder Corp.
Boston, Mass.	H. Boker & Co., Inc.	Montreal, Canada	G. D. Peters & Co. of Canada, Ltd.
Buffalo, N. Y.	Root, Neal & Co.	New Orleans, La.	Wm. D. Seymour Co.
Chicago, Ill.	Machinery & Welder Corp.	New York, N. Y.	H. Boker & Co., Inc.
Cincinnati, Ohio	Williams & Co., Inc.	Oklahoma City, Okla.	Hart Industrial Supply Co.
Cleveland, Ohio	Williams & Co., Inc.	Pampa, Texas	Hart Industrial Supply Co.
Columbus, Ohio	Williams & Co., Inc.	Pittsburgh, Pa.	Williams & Co., Inc.
Detroit, Michigan	C. E. Philips & Co., Inc.	Portland, Ore.	J. E. Haseltine & Co.
Erie, Penna.	Boyd Welding Co.	Rochester, N. Y.	Welding Supply Co.
Fresno, Calif.	Victor Equipment Co.	San Diego, Calif.	Victor Equipment Co.
Ft. Wayne, Ind.	Wayne Welding Sup. Co., Inc.	San Francisco, Calif.	Victor Equipment Co.
Honolulu, Hawaii	Hawaiian Gas Products, Ltd.	Seattle, Wash.	J. E. Haseltine & Co.
Houston, Texas	Champion Rivet Co. of Texas	St. Louis, Mo.	Machinery & Welder Corp.
Kansas City, Mo.	Welders Supply & Repair Co.	Syracuse, N. Y.	Welding Supply Co.
Kingsport, Tenn.	Slip-Not Belting Corp.	Tulsa, Oklahoma	Hart Industrial Co.
Los Angeles, Calif.	Victor Equipment Co.	Wichita, Kansas	Watkins, Inc.

THOMAS
Flexible COUPLINGS
FOR *any* SPEED OR SERVICE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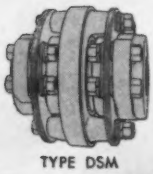
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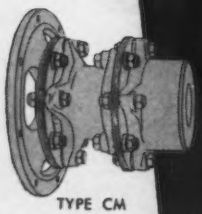
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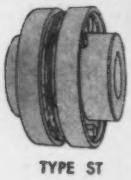
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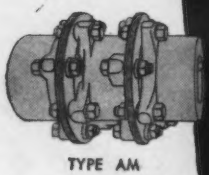
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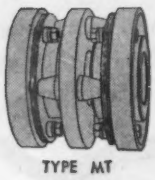
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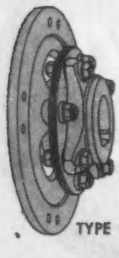
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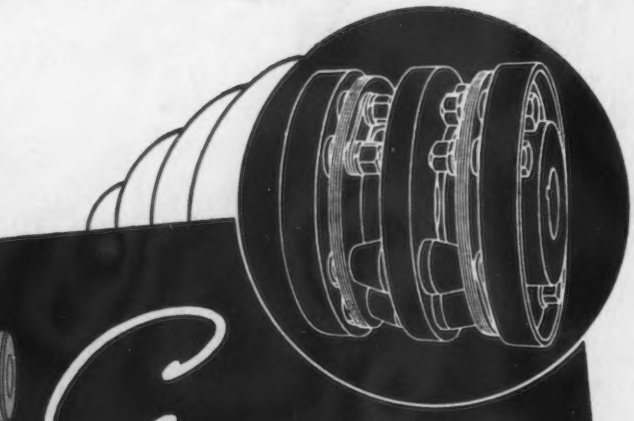


Eliminate

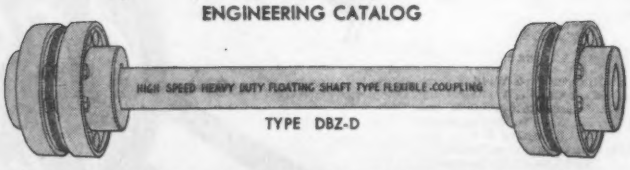
BACKLASH, FRICTION, WEAR AND CROSS-PULL

.....the 4 destructive evils found in all other types and makes of couplings.

NO BACKLASH
NO WEAR
NO LUBRICATION
NO THRUST
FREE END FLOAT

These are the five essential features of Thomas Flexible Couplings that insure a permanent care-free installation.

WRITE FOR COMPLETE ENGINEERING CATALOG



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THE THOMAS PRINCIPLE ELIMINATES CHAINS, SPUR GEARS and other VIBRATING MAKESHIFTS

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

Weldon Spring, Mo., $1,500,000; Western Electric Company Project, Eau Claire, Wis., $1,000,000.

Dozens of small projects, some as high as half million dollars each, round out the program, and advance plans are being formulated for the additional expansion of these and other plants, if found necessary.

Larger Number Of Tin Cans Slated For Detinning Plants

Washington

• • • **An increased number** of tin cans will be sent to detinning plants and the recovered tin channeled to the most vital uses, WPB announced on Oct. 7, as the result of its prohibiting the further use of salvaged tin cans for the manufacture of bottle caps or crowns. Its Direction 1 to M-325, revoking such use of tinned scrap, was prompted by the fact that additional quantities of black plate have been made available to crown manufacturers.

However, material that is now in the possession of the user or manufacturer may be used for the production of bottle caps or crowns until Jan. 1, 1945. This direction does not prevent any person from assisting in the collection of used tin cans for salvage, but none of the cans so collected may be used in the manufacture of bottle caps or crowns, WPB explained.

Steel Payrolls Up, Employee Total Down

New York

• • • **Payrolls in the steel industry** increased in August from the July levels, according to a report released recently by the American Iron and Steel Institute. The average number of employees decreased.

The August payroll was $143,900,100. The July payroll amounted to $141,794,000. In August, 1943, the payroll was $139,855,000.

The industry employed in August an average of 569,200 workers, compared with 571,400 in July. In August, 1943, the total number of employees was 625,200.

Wage-earning employees received an average of 116.9c. per hr. in August, compared with 120.0c. in July and 113.3c. in August, 1943.

Wage earners worked an average of 47.5 hr. in August, as against 45.4 hr. in July and 43.1 hr. in August, 1943.

IT'S FAST! IT'S EASY! IT'S ACCURATE! . . .

You simply insert one end in the Vee-block, tighten the hand wheel and advance the center drill—then reverse the bar and center the other end. Your Quickcenter will do—in less than a minute—a job that may take over half an hour on a lathe . . . and do it far more easily and more accurately. The Murchey Quickcenter, small and compact, increases shop output, uses unskilled operators, saves time and material—and increases your profits.

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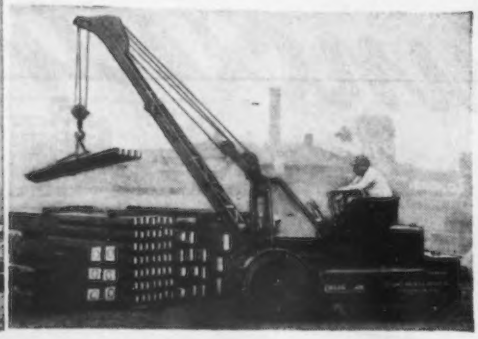
HOW TO HANDLE STEEL *Faster*



Move a KRANE KAR up to a pile of forgings, bars, blooms, billets, ingots, castings (or a scrap heap when equipped with an electric magnet), and top the boom with the full load. Transport load forward or backward and position it on either side in places inaccessible to a rigid boom crane. Make speed with the all-around safety features—stability without outriggers or jacks, automatic braking of load and boom, easy steering, and utter simplicity of operation. Write for catalog.

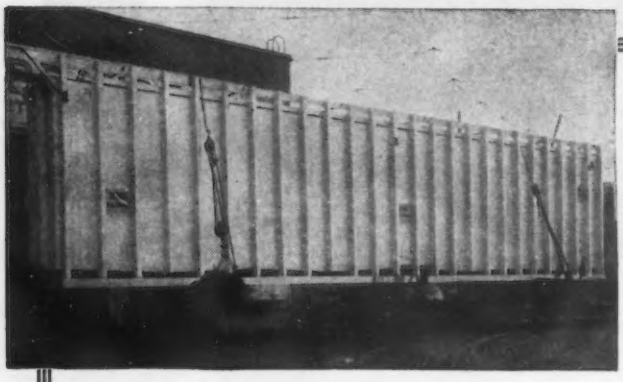
USERS: Carnegie-Illinois; Bethlehem; Republic; General Motors; Consolidated; American Smelting & Refining; Lima Locomotive Wks.; etc.

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR

SILENT HOIST & CRANE CO., 851 63RD ST., BROOKLYN 20, N.Y.



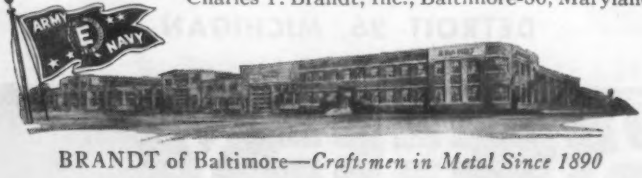
30-TON PLATING TANK for use with Continuous Electrolytic Tinning Lines in an eastern steel mill. Built of ½" steel plate, inside dimensions: 4'4" x 11'6" x 51'0" Plating Tank and Tinning Lines engineered, fabricated, installed by Brandt.

Heavy Plate or Light Sheet—

Call BRANDT of Baltimore

for Precision in Heavy Plate and Sheet Steel Work

Here is an 8½ acre plant . . . with the most modern equipment for shearing, rolling, forming, welding and completely fabricating ferrous, non-ferrous and alloy metals to your specifications . . . from the lightest gauge up to and including 1¼" mild steel or ¾" armor plate. Extensive war contracts necessarily limit our present acceptance of new business for immediate delivery. For information, address: Charles T. Brandt, Inc., Baltimore-30, Maryland.



BRANDT of Baltimore—*Craftsmen in Metal Since 1890*

Industry May Buy Vital Machine Tools From Army District

Pittsburgh

• • • **Industry in the Pittsburgh Ordnance District will be given an opportunty to purchase from the Ordnance Department such standard purpose machine tools as are available and necessary to their production. The Pittsburgh Ordnance District holds title to many of the machine tools being used by district plants making ordnance materiel and the current machine tool situation has eased to the point where an excess of certain Ordnance-owned tools exists.**

In order to expedite production where possible, the Ordnance District will, according to a statement by Lt. Col. Robert C. Downie, district chief. Pittsburgh Ordnance District, permit the current users of certain standard general purpose machine tools to purchase them under a rigid schedule of prices dependent upon the period of active use of the tools.

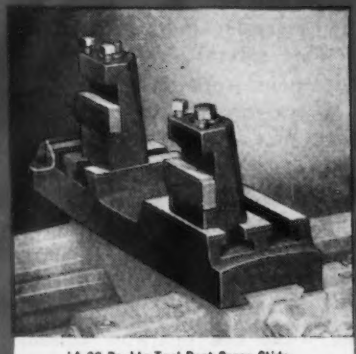
Where the machine tools are in excess currently and the present user does not desire their permanent acquisition, other potential users will be permitted to purchase the tools at a slightly lower price. In all cases, the price is determined by the number of months the machine tool has been in active service, and is not dependent upon the condition or age of the tool, in accordance with Surplus War Administration Regulation No. 3, Aug. 9, 1944.

These tools, all of which are the type readily adaptable to civilian production, may be used for war production and reconversion purposes by the present user, or they may be used for direct war-contributing production by either the original user or any other buyer.

Companies or establishments wishing to take advantage of this opportunity to replace worn or outmoded machine tools are advised to contact the Production Equipment Section of the Pittsburgh Ordnance District, 1202 Chamber of Commerce Building. Pittsburgh 19, Pa.

All bills of sale will carry the following provision: "The buyer agrees that, in the event any machine tool sold hereunder ceases to be used for war production purposes prior to the cessation of hostilities while in possession of the buyer, the buyer will, upon request of the War Department *make the machine tool available for further war production use* upon terms to be

A Logan SCREW CUTTING LATHE BECOMES A TURRET LATHE WITH THIS ASSEMBLY



LA-29 Double Tool Post Cross Slide

LA-25 Double Tool Post Cross Slide

DOUBLE TOOL POST CROSS SLIDES

For use in connection with the Turret Assembly. No. LA-29 is interchangeable with your present Compound Rest. No. LA-25 fits on bed of your present lathe.

With the Logan 6-Position, Self Indexing Turret Assembly, your present Logan Screw Cutting Lathe becomes a *dual purpose* lathe of sustained accuracy, equally dependable for general purpose work, or for high speed production. The Logan Turret Assembly will fit the bed of your screw cutting lathe perfectly, so that tailstock and turret are interchangeable to meet the job in hand. To guarantee accuracy, the Turret Assembly is shipped to you rough bored to 9/16" so that you can finish bore it to 5/8" from your own headstock. Check with your Logan Lathe dealer regarding the advantages and the economy to be gained by equipping your present lathe with the Logan Turret Assembly.

FOR MAXIMUM EFFICIENCY, USE THESE STANDARD LOGAN TURRET LATHES

No. 830 Hand Screw Machine

No. 840 Quick Change Gear Turret Lathe

No. 850 Manufacturing Turret Lathe

Logan

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

280,000 shot hurled every second by the Airless Wheelabrator. You can easily visualize the cleaning power represented by that tremendous volume of individual impacts.

Speed is paramount in metal cleaning efficiency and the above unretouched photograph of automotive forgings shows a typical "before" and "after" example of how directional control made every shot count. Note the bright, scale-free finish obtained. Cleaning like this takes less than ten minutes per load on the average. Compare this with less modern methods and you will realize that "Wheelabrating" is synonymous with "Speed Cleaning".

Equally important is the fact that airless Wheelabrator abrasive blasting is the *only* practical method of obtaining the uniformity and variety of finishes so necessary today. Two exclusive Wheelabrator design features make this possible:

(1) Perfected directional control of the blast stream; and

(2) a range of blast wheel sizes to provide the velocities required for various finishes.

Many customers now demand Wheelabrator parts, because they have a better appearance, take an excellent finish, and machine more easily with less tool wear.

Write for more information today!

American
FOUNDRY EQUIPMENT CO.
510 SOUTH BYRKIT STREET MISHAWAKA, INDIANA

agreed upon between the War Department and the buyer. The War Department agrees that it will make such request only in the event a suitable machine tool is not available from idle or surplus stocks in the hands of the War Department or a surplus disposal agency of the government."

Col. Downie stated that, "It is hoped that this current loosening of standard purpose machine tools suitable for civilian production, even though it may be temporary in a few cases, will materially speed war production in the area, as well as aid any authorized reconversion where such is possible."

Developments in Honing

[CONCLUDED FROM PAGE 67]

tic holders touch the ring gage below the work. The friction generated turns the ring gage in a slight arc, actuating a microswitch which initiates withdrawal of the tool.

Employing this means, multiple spindle setups can be arranged and are now operating in the Micromatic shops. This makes possible progressive honing of work on a production basis, as exemplified in one three-spindle machine, Fig. 1. This machine progressively rough hones, semi-roughs and then finish hones, with a differently sized ring gage controlling each spindle. When the last spindle withdraws, the fixture automatically indexes one station and honing then resumes while the operator unloads and reloads the idle station in front of him.

In a variation, Fig. 2, a two-spindle machine rough hones or finish hones two pieces simutaneously, the machine automatically indexing 120 deg. to position two new pieces for machining with each turn.

On larger work, Micromatic has devised a system of pressure fluid gaging akin to air gaging, Fig. 3, using the cutting oil for the medium. The cutting oil flows from jets against the cylinder wall, the distance between the two elements being sufficiently close to build up a substantial back pressure in the line. As the diameter is enlarged, the pressure drops. The pressure which will be obtained when the bore is at the desired diameter is determined experimentally; thereafter the operator shuts off the machine when this predetermined gage reading is reached. The method is known as Hydrosizing. It can be made auto-

Rough forging, before machining, of towing shackle of Rustless 16-2 stainless steel (Chromium 15-17%, Nickel 1.25-2.50%, Carbon .20% max.), the alloy whose strength, impact and corrosion resistance and favorable strength-weight ratio make it especially valuable in marine and in other exacting services.

IT HAS BEEN SAID that 16-2 stainless steel (Type 431) was forgotten in this country, but Rustless did not neglect it. On the contrary, we learned how to handle it, have produced many thousands of tons of it successfully, and have helped our customers learn how to work it.

This grade is unusually tough in the hardened and stress-relieved condition. In that condition, it has an ultimate tensile strength of 175,000 PSI min.; yield strength, 135,000 PSI min.; elongation in 2", 13% min.; and a minimum Izod impact strength of 35 ft. lbs. It has excellent resistance to certain types of corrosion, especially salt spray, tap water, steam and food products including fruit juices. In fact, 16-2 has the best corrosion resistance of any stainless steel hardenable by heat treatment. This gives it a definite advantage over the more customary 18-8 alloy for parts of such large section that cold working is impractical.

Rustless knows how to produce sound ingots and perfect bar, rod and wire of 16-2. Equally important, we have solved the once-vexing problem of heat treatment, so that the desired characteristics can be obtained in any shop with accuracy and uniformity. Data and instructions are available on request, on this and other stainless steels.

Write for new booklet, just off the press: "Heat Treatment of Stainless Steels." . . . Rustless Iron and Steel Corporation, Baltimore 13, Maryland.

RUSTLESS

Producing STAINLESS STEELS *Exclusively*

SALES OFFICES: BALTIMORE • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND
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THIS SOLVES OUR PROBLEM ON POST-WAR PRECISION PARTS!

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It points the way to a dependable source of supply for precision parts and assemblies for your post-war requirements on a contract basis. As specialists in close-tolerance production, the Adeco organization offers complete facilities to meet your most exacting specifications particularly in the field of hydraulics.

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AIRCRAFT & DIESEL EQUIPMENT CORP.

4405 North Ravenswood Avenue

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matic through the use of a pressure switch.

To make possible rough honing of an order which really falls into a metal removing classification, rather than a finishing category, Micromatic engineers have evolved so-called Harzlite impregnation of the abrasives of the honing stick. This impregnation makes more uniform wear possible by anchoring the grits more firmly in place without hardening the bonding material. Bond fracture is thereby controlled more uniformly, and greater grit penetration is possible without loosening from the bond. Stone life is lengthened, and its ability to take heavy bites out of metal is enhanced.

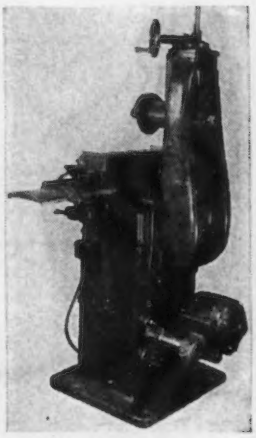
Molding of the plastic holder around such sticks has made possible considerable simplification of the entire honing tool assembly. The plastic piece can simply be snapped into place, rather than delicately fitted, and the number of parts in a five-stone tool, as an illustration, has been reduced from 50 to 15.

Your Incentive Will Work

[CONTINUED FROM PAGE 61]

result in a 15 to 20 per cent increase in output above normal performance. On the other hand, the feeding of small, eccentric-shaped pieces requiring pickup with tweezer, careful prepositioning, and careful location on several pins may call for a very high degree of coordination and skill. Many fine subassembly operations requiring testing for free running and calling for careful adjustment of parts call for a very high dexterity and visual concentration. On such work, excellent skill and rhythm with only average effort could easily result in an output 15 to 25 per cent above normal. Average skill and excellent effort, however, might result only in a negligible increase in output above normal. The fact that skill and effort play widely varying roles on different types of work is recognized in most methods of job evaluation, and different weights are assigned to indicate the part that each plays in the completion of a given task. If this is true in classifying jobs, then it is certainly true in rating different types of operator performance.

Probably the simplest leveling method is one which is based upon the use of 100 per cent to designate "normal" or "average" performance. The use of 100 per cent as the basis for rating performance is much easier



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By eliminating complicated pulley arrangements and costly lineshaft maintenance, Masterdrives power surface grinders for maximum efficiency and economy.

Masterdrives for surface grinders are engineered as complete units ready to install. No machine work needed. Proper belt tension is maintained at all times.

For information on Masterdrive for your grinders, simply state the make. Masterdrives are supplied in 750 specifications for practically every machine tool drive requirement. Phone, write, or wire today!

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THE MASTER ELECTRIC COMPANY

INDUSTRIAL EQUIPMENT DIV. — DAYTON, O.

You'll need steel fast!
Reprinted from American Metal Market
WPB Lays Plans For Civilian Goods
Program Designed To Speed Reconversion
WASHINGTON—Acting Chairman J. A. Krug, of the War Production Board, has announced, following a meeting of the full Board, that the Army, Navy, and major war agencies have unanimously agreed on a program designed to provide the utmost stimulus to reconversion when Germany is defeated, while at the same time, protecting production necessary for the Japanese war.
Acting upon findings that there will be a reduction of about 40% of war production within three months after the defeat of Germany which will free over 4,000,000 workers, the Board decided to:
1. Remove almost all controls over materials immediately upon the defeat of Germany except those that are absolutely necessary to assure the reduced measure of war production necessary to beat Japan. This means that all manufacturers can use any plant and any materials that are not needed for military production for any civilian production.
2. The War Production

Remember Frasse!

Reconversion brings plenty of problems—but steel need *not* be one of them. Changeovers can be made months earlier by using warehouse stocks; tons of steel are ready in Frasse plants—available the moment your designs are set.

Frasse stocks of cold finished bars, tubing, stainless steel, alloy, and aircraft steels have more than doubled to serve your needs. By buying from these stocks for immediate production, you can save weeks, even months, in reconverting to peacetime products.

The pent-up demand for *your* product will not wait on dragged-out deliveries. No matter when your reconversion starts—you'll need steel fast. Call Frasse.

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MECHANICAL AND AIRCRAFT STEELS

COLD FINISHED CARBON BARS, SHEETS AND STRIP • SAE, AISI AND NE ALLOY BARS • DRILL ROD • AIRCRAFT ALLOY BARS AND TUBING • STAINLESS STEEL SHEETS, STRIP, PLATES, BARS, WIRE, PIPE AND TUBING • SEAMLESS CARBON AND ALLOY TUBING • SEAMLESS PIPE AND CONDENSER TUBING • WELDED CARBON AND ALLOY TUBING

PETER A. FRASSE & CO., INC. 17 Grand St., New York 13, N. Y. (Walker 5-2200) • 3911 Wissahickon Ave. Philadelphia 29, Pa. (Radcliff 7-100 - Park 5541) • P. O. Box 946, Buffalo 5, N. Y. Washington 2000 Jersey City 2, N. J. • Hartford 5, Conn. • Rochester 4, N. Y. • Syracuse 2, N. Y. • Baltimore 2, Md.

WHISPERING CAMPAIGN

Word of mouth travel has built up a list of almost 1,000 users of Strenes metal ranging over 36 states, employing this unusual alloy in many ways.

Its principal use is for drawing and forming dies . . . body tops, fenders, radiator grills, hoods, lamps . . . refrigerator tops, sides, doors, trays . . . stove parts, tractor parts, farm implement parts, caskets, grave vaults, etc.

Strenes can be cast very close to shape (usually 1/16") . . . thereby greatly reducing machining time. Its graphitic lubrication rate is very high, hence runs of 1,000,000 deep draw parts are not unusual.

Here is an alloy you should look into and we are ready to cite hundreds of plants for you to contact on the subject.

Also . . no matter how extensive your tooling program Advance has the capacity to handle the casting end and give you excellent service.

THE ADVANCE FOUNDRY CO.

100 Seminary Ave., Dayton 3, Ohio

to understand and to manipulate than the "point hour" system. Normal (100 per cent) performance is one which can be expected from an operator of good skill, working in a natural, normal manner at a pace which can be maintained for the entire working day without excessive fatigue. The movements of the hands and the body should be synchronized to achieve natural rhythmic movements, and all unnecessary movements should be eliminated.

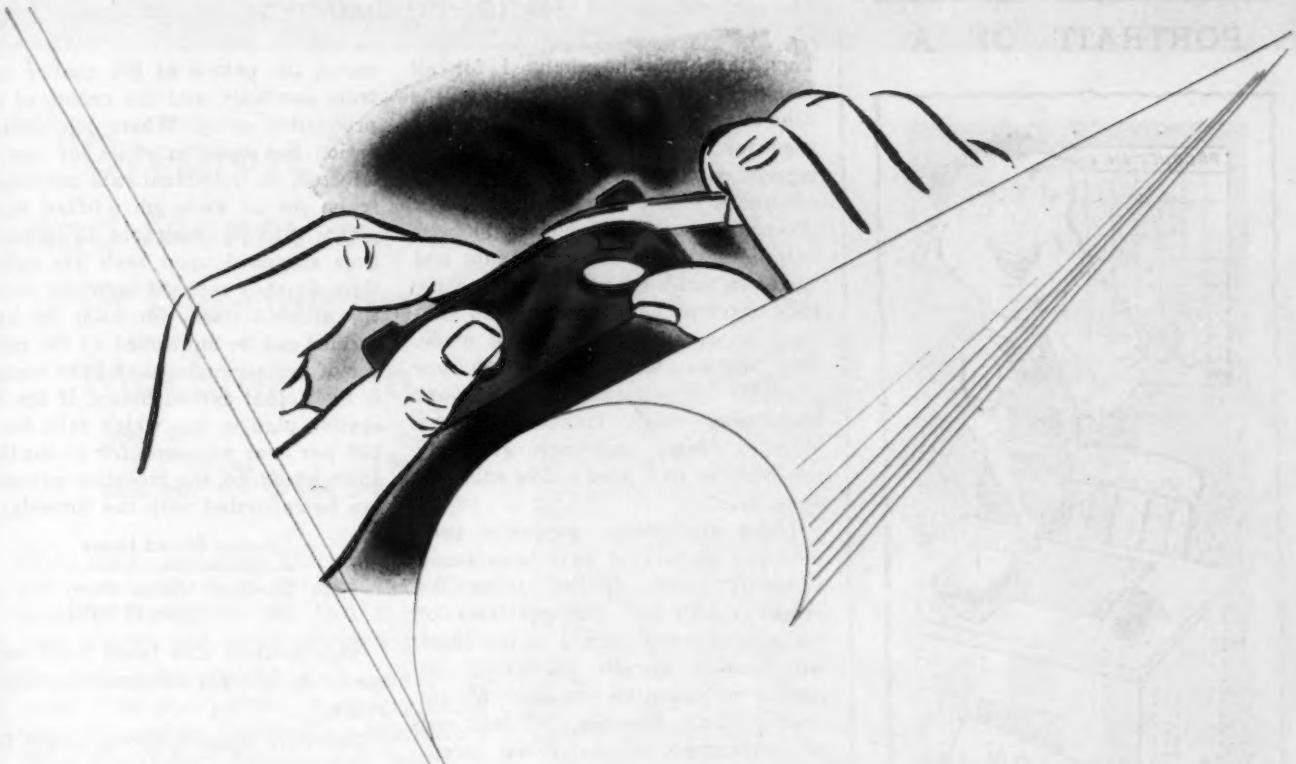
The most important factor in performance rating is the trained and experienced judgment of the time study engineer. For this reason, we have found that any fixed scale of performance rating into which the time study engineer has to fit his impression of the manner in which a job is being performed tends to interfere with clear judgment. Since "normal" is in itself subjective, in that it is the product of judgment and definition, it cannot be measured exclusively through formulas. The time study engineer, through his analysis of the work required, should be able to visualize the manner and the pace with which the work can be performed. As the time study engineer observes and records the performance of each element, he should be conscious of the manner in which the work is being performed as compared to his mental image of the way in which it should be done. As the operation moves from element to element, the engineer can easily visualize the fact that the performance is ¼ better than normal or ⅛ or 1/5 or 1/3 or 1/10. Thus the time study engineer mentally measures the performance in terms of a percentage of normal. This is the greatest advantage of the use of 100 per cent as a base instead of the various bases of the several "point hour" methods.

Consistency of Rating Important

The most important thing that the time study engineer must bear in mind in performance rating is that all standards must be consistent. Other things being equal, in nine cases out of ten the secret to successful standards is consistency. Each standard within a given classification must call for a uniform level of exertion and a uniform level of skill. This level of performance must be maintained for all standards. Any deviation from this level produces tight or loose standards.

The average experienced time study engineer should have no difficulty in setting consistent standards if he does not allow himself to be influenced by considerations of present performance. Once a level of performance has been decided upon, it should be adhered to until such time as it is decided that the level should be changed.

GIANT TRUCK: *Harry Seanor, vice-president of Mack Trucks, Inc., inspects a new,* 100,000 *lb. coal truck in the company's yards. One of* 30 *built for the British Ministry of Supply, these six-wheel, Diesel-powered giants are equipped with telescopic hydraulic hoists.*



Have you looked into this saving in *ASSEMBLY?*

OF COURSE a skilled mechanic can machine solid brass to the uniform gauge of a Laminum shim... fitting machine parts to the same critical precision.

But when you can simply *peel* .002 or .003-inch laminations from the solidly bonded Laminum shim, will your costs stand the time for machining?

Write for the Laminum application photo chart illustrating scores of uses... from aircraft to diesels. Laminum shims are cut to your specifications. Shim materials for maintenance use are sold through industrial distributors.

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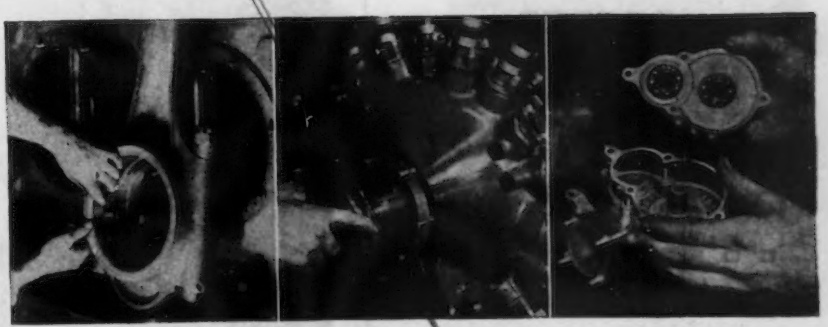

it's **LAMINUM**
THE SOLID SHIM THAT *peels* FOR ADJUSTMENT

2213

PORTRAIT OF A

who reports a decided increase in total output because he uses SCREW MACHINE PRODUCTS made FASTER and BETTER for LESS by

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AMHERST • OHIO

Chicago Detroit New York

Then it should be changed for all standards. The actual details of the time study procedure which should be used for time measurement will be largely determined by the particular conditions in the plant. Certain basic procedures, such as element separation of each job into constants and variables and a separation of machine time, machine handling time and handling time, should always be made. The special techniques which are available for particular types of work have been widely treated in many standard texts and are generally available, so they need not be enlarged upon here.

There are several generally used incentive plans that have been found successful when applied under the proper conditions. The problems of manufacture and control in the plant will largely govern the choice of method of incentive payment. All incentive plans, however, fall into one of two categories: Individual incentives and group incentives. Generally, individual incentives are preferable in that under an individual incentive the incentive earnings of each employee is limited only by his own output. The reward is, therefore, closely identified with the effort, and a maximum stimulation of each operator is attained. However, group incentive, when properly applied on balanced tasks, will produce excellent results. Generally, the basic considerations in choosing between individual and group plans are the extent to which individual output on individual jobs can be measured, the nature of the quality controls available, and the nature of the production setup. Where job classification has been in effect, or can be effected, an individual rate can usually be set on each job. Often many plants find it desirable to place a time standard upon each job rather than a money rate. At each pay period the allowed times for each job performed can be multiplied by the number of units completed and the answer is the actual earned hours. If the incentive plan is one which calls for a 100 per cent payment for production above standard, the incentive payment can be computed with the formula:

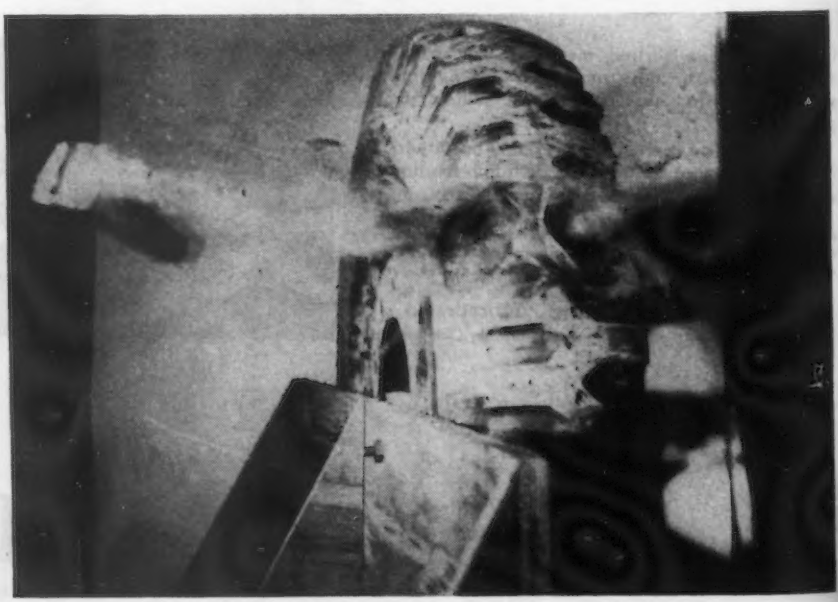
$$\frac{\text{Actual Earned Hours}}{\text{Standard Allowed Hours (for completion of tasks)}}$$

This method also lends itself very easily to use for efficiency measurement.

Incentive plans hold the secret for a tremendous potential increase in modern plant productivity. The production experiences of many industrial groups working under the stimulation of war time conditions have proved how much potential increase in productivity there is in greater employed effort.

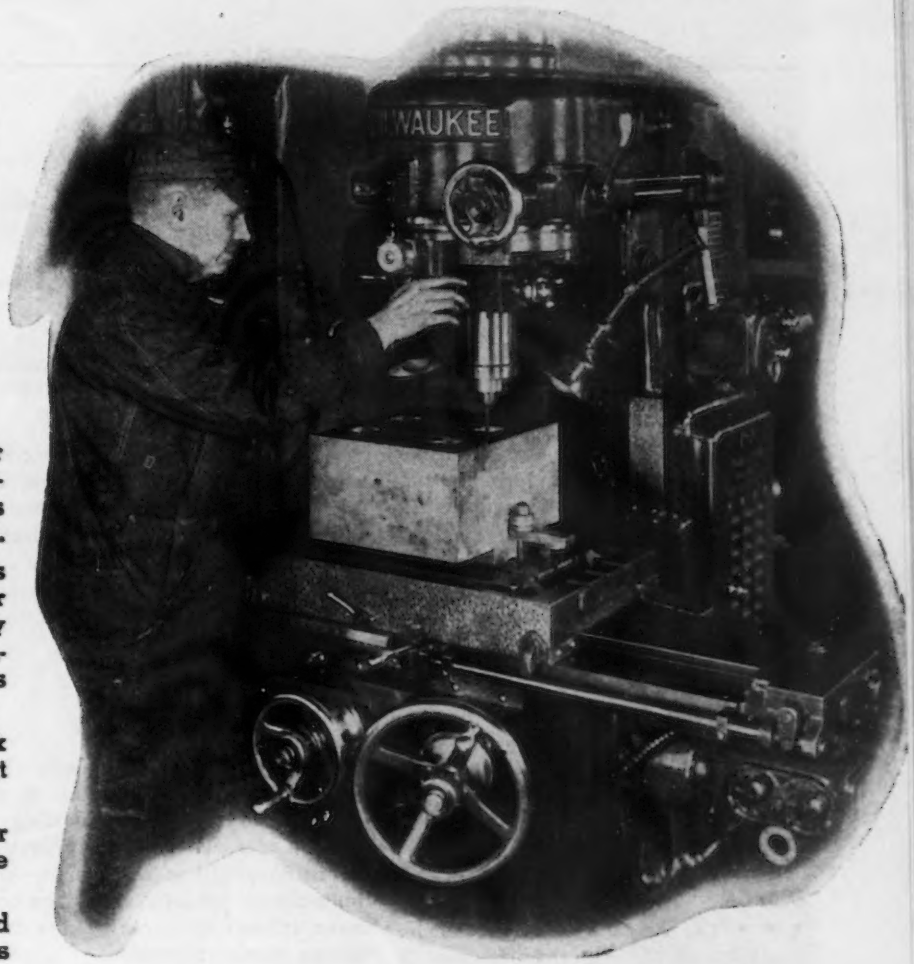
If incentive procedures in general are given anywhere near the amount of careful planning and thought that the production increases which can be obtained with them would seem to warrant, there is virtually no plant that could not profit by their use.

GUNFIRE TEST: *Using micro-flash light, experts at the AAF Materiel Command, Wright Field, Ohio, learn what happens when a 37-mm shell plows through a self-sealing tire which has been in combat for several months.*



MAINE STEEL, INC. *Reports . . .*

"Greatest Time and Money Saver in Die-sinking Machinery in 25 Years!"



"You may remember that about a year ago you sold us a Rotary Head Die-Sinking Machine. We feel that it is time that we told you what we think of it.

The Rotary Head principle has saved us more time and money than any other improvement in Die-Sinking Machinery since Cherrying Attachments were invented more than twenty-five (25) years ago.

The principal reason is that we can sink four (4) impressions complete without moving the work on the table.

This saves three (3) setups out of four (4) when compared to a Rotary Table Machine.

This saving would of course be increased where more than four (4) impressions are needed.

Besides this — the various movements built into this Rotary Head enable us to sink our dies without first laying them out on the Die Blocks.

The machine does its own layout work.

And after a year's experience we can say that these two features have averaged to save us over 30% of our die-sinking time.

Yours very truly,
MAINE STEEL, INC.
A. A. Rines
Foreman—Die Sinking Dept. "

This is typical of the forging dies produced by Maine Steel, Inc. The Milwaukee Rotary Head Miller has saved this firm over 30% in die-sinking time on dies of this type.

Kearney & Trecker's Rotary Head Miller is regarded by the majority of users as the most versatile machine ever designed for die and mold work. Direct — fast — accurate — it reduces initial job preparation and set-up time to the minimum — saves operator's time and assures rapid production of dies and molds. Write for Bulletin No. 1002C for full information on this unusual machine tool.

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

MACHINE TOOLS

. . . News and Market Activities

Bookings Steady in Tool & Die Shops

Detroit

• • • **Bookings in the tool** and die shops in the Detroit area continue virtually unchanged. Some very modest lengthening of the delivery time for jigs and fixtures indicates the possibility that a little postwar work is filtering into the shops, but this is not confirmed.

Compilations based on approximately 135 shops reporting facilities to the tooling information service of the Automotive Council for War Production shows delivery time on jigs and fixtures is averaging slightly under four and one-half weeks. This is about the same as last April. Deliveries were available in slightly over four weeks on an average at the start of July.

Special gages may now be had in slightly over three weeks, as compared with about 3½ weeks in July. Cutting tools can be had on two-week delivery, an improvement of 4 days, on the average, against July.

Employment in the reporting shops is practically unchanged from July, with a notable increase in one shop slightly overbalanced by modest declines in a scattering of others. Employment in a comparative group as of October totals 9707 against 9773 in the same group in July.

o o o

Tool Engineer Group To Publish Magazine Early in February

Detroit

• • • *The Tool Engineer*, the official magazine of the American Society of Tool Engineers, will be published by the Society commencing with the February, 1945, issue, according to the announcement made by Adrian L. Potter, Executive Secretary. For the past ten years, *The Tool Engineer* has been published by an independent contractor.

Membership of the American Society of Tool Engineers comprises more than 16,000 of the leading mechanical and industrial executives in the United States and Canada. These are the men who in addition to planning factory layout, expediting production and planning the progression of manufacturing operations, either influence or actually select the equipment utilized for speeding and coordinating mass production.

Over 1600 members of the Society are either presidents, vice-presidents, owners or officials of the companies represented. The rest of the membership is made up of general works managers, production managers, superintendents, master mechanics, shop foremen, mechanical engineers, chief draftsmen, designing engineers, method engineers, machine and tool designers, draftsmen and purchasing officials.

o o o

Tool Guide Book For Turret Lathe Operators

Cleveland

• • • **A tooling guide book** for lathe operators, entitled, "How to Machine Parts on Turret Lathes," has just been completed by the Operators Service Bureau of the Warner & Swasey Co., Cleveland, and is available to turret lathe operators at 50c. a copy. The guide book, which condenses in simplified and well-illustrated form specific directions for performing all types of turret lathe work, is the fifth step in a long-term program of operator education inaugurated by the company some four years ago. The book defines and describes basic turret lathe machining operations, internal and external; classifies work done on turret lathes into major groups, by nature of product; and explains briefly, and by diagram and illustration, the sequence of operations and tooling for each group.

Of particular interest is the wealth of photographic illustrations of the kinds of work done on a turret lathe—so that, except in a very unusual case, the operator can find in the book an actual picture of work corresponding to the job he has before him.

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Labor Shortages Shows Output

Cincinnati

• • • **While the overall picture** of the district machine tool market is not appreciably changed, a number of manufacturers indicate some slow up in production and shipments because of the labor shortage and difficulty in obtaining necessary materials. Local WMC officials are working hard to scare up additonal labor for the machine tool industry, but as has been true for sometime, they are still scraping the crumbs from the bottom of the barrel. Some unskilled labor still filters in and manufacturers are making the best of whatever is available. While no specific materials are mentioned, builders indicate that they have some jobs waiting around for the necessary constituents to complete them. Despite present difficulties, shipments this month are expected to be better than last, but backlogs are still large. Some new business continues to come in from domestic sources and Russian business also is reported.

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Cincinnati

Much attention today is being directed to postwar plans by district machine tool builders, but no definite announcements have been made. That inquiry for peacetime manufacture is moderately brisk, is well known but the type and size is not subject to revelation because toolmakers cannot treat these as more than interested correspondence. No letup in priorities or price schedules make it possible for manufacturers to give quotations or information that may be valid when shipment becomes possible. Current business, however, continues in good volume so that present operations are well maintained. Labor supply continues to be tight, but WMC indicates its continued cooperation. Shipments this month are expected to exceed last month, but backlogs are still holding into next year.

Quiet

HOOVER

BALL AND BEARING COMPANY
ANN ARBOR, MICHIGAN

BALLS - BALL BEARINGS - ROLLER BEARINGS

NON-FERROUS METALS

. . . News and Market Activities

White Metals Serve in Non-Essential Uses

• • • **Authorized unlimited use** of magnesium for civilian production has created a great deal of interest in the application of this metal for such non-essential purposes as toys, judged by inquiries made to white metal smelters. Steel has been precluded from use for this purpose during the war, and since substitute toys made of wood and cardboard are not widely accepted by the public, the opportunity to make them of magnesium die castings has met with ready response. In preliminary contacts, resistance to use of this metal due to price differentials if any, have not been encountered.

Aluminum and zinc trim is now on sale for use on interior walls and floors. Aluminum and magnesium have now been authorized by the WPB for use in metal storm windows.

In comparison with 400,000 aluminum pressure cookers authorized for production last year for the 1944 canning season, six manufacturers have been authorized this year to produce a total of 630,000 aluminum cookers for the 1945 canning season.

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Mercury

• • • **The price of mercury** is slowly rising as current mine production is far outstripped by consumption. Domestic production during August totaled 2500 flasks. There is some mercury still coming in from Mexico, but not very much. Domestic consumption during August totaled 3900 flasks, the difference coming from government stockpiles. The New York price at the moment is $108 to $110 for spot and nearby but large quantities are not available at this time. This compares with a recent low of $97 after termination in February of the Metals Reserve buying program at a floor price of $192.

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Lead

• • • **The present high rate** of lead consumption which is practically double normal prewar consumption continues to cut into government stocks. Transportation difficulties caused by last month's floods, and labor troubles have recently interfered with shipments from Mexico; but these difficulties have now been largely cleared away and receipts are normal for the war period. This is fortunate for there is some indication that the manpower shortage may cause a drop in domestic production over the next several months. Moreover lend-lease shipments of lead have been greater than anticipated by the industry.

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Aluminum

• • • **The oversupplied aluminum market** has had further adverse effect upon prices of both remelt and scrap. The lowest grades of remelted aluminum, No. 12 Foundry and No. 4 steel dexodizing, are down ¾c per lb. Scrap Dural alloys, except 25S, are down a half cent to a price of 2½c per lb.

It is considered that recent Surplus War Property Administration action in establishing minimum selling prices for surplus aluminum scrap held by government agencies will serve to stabilize and improve prices of scrap aluminum, and perhaps even remelt. As yet there has been no evidence of this because most buyers have laid in heavy stocks at prevailing low prices and are in no position to continue buying.

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Zinc

• • • **In its recently issued report** showing zinc statistics up to September, the American Zinc Institute reports that slab zinc stocks continue to increase month by month as has been the case since the middle of 1942. At the end of September the total stock was 243,749 net tons, an increase of 2056 tons in the face of a drop of 4390 tons in monthly production. The rate of production has been dropping off since March, and September figures represent a total drop of 20,000 tons per month since then.

With the expectation that steel will become freely available for civilian consumption shortly after the defeat of Germany, the industry anticipates that the galvanized steel, pipe and wire markets will begin to cut into the surplus at that time.

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Forgings Publication

• • • **The first issue** of a bulletin on non-ferrous forgings has been released in October by the Brass Forging Assoc. The publication, to be known as the *Non-Ferrous Forgings Digest*, features properties and uses of such forgings and is available upon request. The members of the Brass Forging Assoc. follow: Chase Brass & Copper Co., Waterbury, Conn., Mueller Brass Co., Port Huron, Mich., Scoville Mfg. Co., Waterbury, Conn., Bohn Aluminum & Brass Corp., Detroit, Mich., Revere Copper & Brass, Inc., New York, N. Y., Accurate Brass Co., Inc., Brooklyn, N. Y., The Harvey Metal Corp., Chicago, Ill.

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Copper Restrictions In L-114 Are Lifted

Washington

• • • **WPB has revoked** Order L-114, which restricted the use of copper base alloys and other metals in the manufacture of safety equipment. Items covered by the order included guards, goggles, shields, safety cans, safety clothing, respirators, inhalators, headgear, resuscitating apparatus and protective creams. L-114 as originally issued in May, 1942, drastically limited the use of aluminum, chromium, copper and copper base alloy, nickel and other critical materials. Restrictions were relaxed through numerous amendments as the material supply situation eased.

With the exception of a few restrictions on the use of copper base alloys, the order as most recently amended permitted the use of metals as in prewar models of safety equipment, WPB said. Relatively small amounts of copper base alloys will be consumed as a result of removal of remaining restrictions. The use of rubber and tin in the manufacture of safety equipment is still restricted by Orders R-1 and M-43, respectively.

Primary Metals

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd.	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro. Conn. valley	12.00
Copper, electro. New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$108 to $110.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	8.50 to 9.00
Aluminum, deoxidizing Nos. 2, 3, 4	6.25 to 9.00
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (Phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys†

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2s solids	7.50
Dural alloys, solids 14, 17, 18, 24S	2.50
25S turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	5.00
turnings, dry basis	3.00

Plant scrap, mixed

Solids	2.00
Turnings, dry basis	1.50

Obsolete scrap

Pure cable	7.50
Old sheet and utensils	4.00
Old castings and forgings	3.25
Pistons, free of struts	3.00
Pistons, with struts	1.50
Old alloy sheet	3.00

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

Zinc

New zinc clippings, trimmings	6.00
Engravers, lithographers plates	6.00
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25½
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82-41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

Market Shows a Stronger Tone

• • • **Although stabilized** for the past several weeks, prices for many grades of scrap have fallen so low that bundling and preparation activities in most yards have all but ceased. Unable to continue with normal activities culminating in sales, yards have been discouraging collectors and producers with low offers required by fixed labor and overhead charges. Offerings of scrap to mills have therefore been reduced to the vanishing point.

With one exception scrap markets throughout the country seem to indicate a stronger position. However, there have been no significant increases in prices to point up this summarization of the market. But there are indications that mill inventories are reaching lows at which may call for replenishment. At least there are reports from different districts that mills which have been out of the market recently have made small purchases of scrap this week.

While most districts have reported no changes in prices, there have been scattered revisions in order to bring prices of certain grades into line with the national market. In Chicago, prices have declined for all grades except cast and railroad specialties. This has necessitated revision of the composite scrap price. Turnings are up in Pittsburgh and down in Boston. There are readjustments in West Coast prices.

Cast prices are everywhere at ceilings, with or without limitations as to freight payments, not because they are in urgent demand but because the supply is limited.

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PITTSBURGH—The scrap market here is a bit firmer than it has been for some time, with a few more buyers showing at least a passive interest in future deliveries. There is an expected break in the heavy breakable cast price, which if strong enough might be reflected in the other cast grades, all of which have been bringing ceiling prices in the face of a falling market in industrial scrap.

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CHICAGO—Despite moderate purchasing by a major consumer of selected items, the Chicago market remains extremely spotty. Prices quoted on many items have yet to be confirmed by mill purchases. Bundled machine shop turnings appear to have dropped from the market altogether and, barring a reversal in trend, may be absent indefinitely. No. 3 bundle market also appears ephemeral, giving further indication that less desirable open hearth grades may be a thing of the past as far as active trading is concerned. Foundry buying, although slight, is characterized by more stringent freight limitations with $2.50 freight approximating the maximum specified on better cast grades.

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DETROIT — Scrap prices appear to have found their level in this market after declining around 30 per cent from open hearth grade ceilings and more than 50 per cent from the blast furnace grade tops. A fair amount of movement is noted. With shipments to other centers going forward on a steady although modest scale by boat, small quantities of electric furnace and blast furnace scrap continue to be bought locally. Brokers and dealers are taking note of the fact that each week seems to see another mill or two which has been out of the market coming in for small purchases at current price levels. All prices continue unchanged.

New Officers Elected

• • • **New officers for the coming year were elected by the Pittsburgh Chapter of the Institute of Iron and Steel Scrap, Inc. They were: President, Jay Stephens, Stephens-Ruffner & Co.; vice-president, L. W. Landay, M. N. Layday Co.; Ray Meister, Max Solomon Co., Inc.; treasurer, Robert Jacobson, Luria Bros. and Co., Inc., and chairman of the executive committee, William L. Behm, United Iron and Metal Co.**

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PHILADELPHIA — The scrap market here has definitely leveled off. Except for material bought by a large consumer based on $15.50 a gross ton for No. 1 steel, there have been no other purchases. Shipments have declined about 40 to 50 per cent and dealers are being forced to stockpile their receipts. Only industrial scrap is flowing freely.

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CINCINNATI — The market continues to be quiet so far as actual productive activity is concerned, but there seems to be a feeling of watchful waiting prevalent. Shipment of some low priced scrap from outside areas on purchase from government surplus reported, but this has not affected the price structure in this area as dealers are still holding to present quotations. There is a feeling of underlying strength in the present market which is probably the result of lack of substantial quantities of scrap available for purchase and dealers generally are not inclined to sell at present quotations but at the same time they show extreme reluctance to hold a long position.

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BOSTON—Chaos prevails in turnings. Large dealers offer as little as $3.50 a ton delivered yard for alloy free and $1 a ton for alloy turnings. However, others report the market for any kind of alloy free turning is $4 a ton on cars, and brokers $4.50. A true sense of values is difficult under the circumstances. On the other hand, the market for heavy melting steel, chemical borings and foundry cast, for the third succeeding week, remains unchanged.

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NEW YORK—The movement of scrap in this area is in very low volume and this has had a strengthening effect on the market, although its proportion is not yet sufficient to have affected prices. At least there have been three weeks of stabilization with a promise of market improvement to come. Mills have been practically out of the market for so long a time that certain local dealers anticipate their requirements must force them to buy soon, and any volume of buying now would serve to force prices up. Cast scrap grades are still sold at ceilings.

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LOS ANGELES—After informal bids and on so-called open allocation, representative quantities of prepared shipyard scrap have been sold this past week by the Maritime Commission at Portland, Oregon, and Sausalito, Cal., below ceiling and on the current open market basis for No. 1 melting open hearth grade, delivered to consumer. West Coast mill buyers express themselves as unwilling to pay a premium for prepared shipyard scrap. In southern California currently and for the next 45 days at least No. 1 heavy melting will move at $2.00 below ceiling with differentials for No. 2 grade and No. 2 and No. 3 dealers' bundles. Dealers in the San Francisco Bay area have been recently buying and processing up to 75 per cent Army and Navy scrap from offshore and ship and ordnance construction.

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BIRMINGHAM — Foundry material which has been bought at a low figure is about the only type of scrap moving here. Indications that would point to the strengthening in the near future of a very weak market are lacking.

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BUFFALO—Despite a nominal decline of 50c. to $1 a ton in open hearth grades this week, mills showed no signs of reentering the market here. The reductions, however, narrowed the gap between dealers' ideas and those expressed by some consumers. Since early September, mills have confined their buying locally to occasional bargains which fail to provide a reliable picture of the market. Although lake and canal shipments are still a factor, some of the large consumers have reduced inventories. Last week 5,000 tons arrived from Duluth by boat and an equal tonnage came through the canal from the East.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4).

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melt	$16.00 to	$16.50
RR. hvy. melt	17.00 to	17.50
No. 2 hvy. melt	15.00 to	15.50
RR. scrap rails	....	21.50
Rails 3 ft. and under	....	23.50
No. 1 comp'd sheets	16.00 to	16.50
Hand bdld. new shts.	15.50 to	16.00
Hvy. axle turn.	15.50 to	16.00
Hvy. steel forge turn.	15.50 to	16.00
Mach. shop turn.	9.00 to	9.50
Short shov. turn.	12.00 to	12.50
Mixed bor. and turn.	9.50 to	10.00
Cast iron borings	11.00 to	11.50
Hvy. break. cast	16.50 plus frt.	
No. 1 cupola	20.00 plus frt.	
RR. knuck. and coup.	21.50 to	22.00
RR. coil springs	21.50 to	22.00
Rail leaf springs	21.50 to	22.00
Rolled steel wheels	21.50 to	22.00
Low phos. billet crops	24.00 to	25.00
Low phos.	19.00 to	19.50
RR malleable	22.00 plus frt.	

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.25 to	$16.75
No. 2 hvy. melting	15.50 to	16.00
No. 1 bundles	15.75 to	16.25
No. 2 dealers' bndls.	14.25 to	14.75
Galv. bundles (No.3)	12.25 to	12.75
Mach. shop turnings	7.50 to	8.00
Short shoveling trngs.	8.00 to	8.50
Cast iron borings	8.00 to	8.50
Mix. bor. & short turn.	8.00 to	8.50
Low phos. hvy. forge	19.50 to	20.00
Low phos. plates	18.25 to	18.75
No. 1 RR hvy. mltng.	18.25 to	18.75
Reroll rails	....	22.25
Cut rails, 3 ft. and under	21.25 to	21.75
Locomotive tires, cut	18.75 to	19.25
frames	18.25 to	18.75
Cut bolsters & side frames	18.75 to	19.25
Angles & splice bars	19.75 to	20.25
No. 3 steel wheels	19.00 to	19.50
Couplers & knuckles	19.00 to	19.50
Miscellaneous rails	19.25 to	19.75
Agricul. malleable	19.50 to	20.00
RR. malleable	20.50 to	21.00
St'dard stl. car axles	23.00 to	23.50
FOB shipping point		
No. 1 mach. cast	....	20.00
No. 1 agricul. cast	....	20.00
Cast iron car wheels	....	20.00
Hvy. breakable cast	....	16.50
RR grate bars	....	15.25
Brake shoes	....	15.25
Stove plate	....	19.00
Clean auto cast	....	20.00

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.50 to	$16.00
No. 2 hvy. melting	14.50 to	15.00
No. 1 bundles	15.50 to	16.00
No. 2 bundles	13.50 to	14.00
Mach. shop turnings	6.00 to	6.50
Shoveling turnings	7.00 to	7.50
Cast iron borings	7.50 to	8.00
Mixed bor. & turns.	6.00 to	6.50
No. 1 cupola cast	....	21.00
Hvy. breakable cast	....	16.50
Low phos. plate	20.00 to	21.00
Scrap rails	20.00 to	21.00
Stove plate	16.00 to	16.50

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	....	$10.00
No. 2 hvy. melting	....	9.00
Bundled skeleton	....	9.00
Turnings, shovelings	4.00 to	4.50
Turnings, regular	4.00 to	4.50
Mixed bor. & turns.	3.00 to	4.50
Mixed alloy turnings	3.00 to	3.50
Clean cast chem. bor.	13.06 to	14.15
Delivered to fdry. per gr. ton		
Breakable cast	21.57 to	21.87
Stove plate	20.00 to	23.51
Machinery cast, truck	21.00 to	23.51

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$11.00 to	$11.50
No. 2 hvy. melting	11.00 to	11.50
No. 1 bundles	11.00 to	11.50
New busheling	11.00 to	11.50
Mach. shop turnings	5.00 to	5.50
Short shov. turnings	6.25 to	6.75
Cast iron borings	5.75 to	6.25
Mixed bor. & turns.	5.00 to	5.50
No. 1 cupola cast	19.00 to	20.00
Charging box cast	14.50 to	15.50
Hvy. breakable cast	13.00 to	13.50
Stove plate	17.00 to	17.50
Flashings	11.00 to	11.50
Low phos. plate	14.00 to	15.00
Automotive cast	19.00 to	20.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	....	$14.50
No. 2 hvy. melting	....	13.50
No. 2 bundles	....	12.50
Mach. shop turnings	$10.00 to	10.50
Shoveling turnings	12.75 to	13.00
Cast iron borings	12.00 to	12.50
Mixed bor. & turns.	10.00 to	10.50
No. 1 cupola cast	20.00 plus frt.	
Hvy. breakable cast	16.50 plus frt.	
Cast, charging box	19.00 plus frt.	
Hvy. axle, forge turn.	16.25 to	16.75
Low phos. plate	18.25 to	18.75
Low phos. punchings	19.75 to	20.25
Billet crops	18.25 to	18.75
RR. steel wheels	19.50 to	20.00
RR. coil springs	19.50 to	20.00
RR. malleable	22.00 plus frt.	

ST. LOUIS

Per gross ton delivered to consumer:

Hvy. melting		$16.00
No. 1 locomotive tires	$16.00 to	16.50
Misc. stand. sec. rails	18.00 to	18.50
Railroad springs	17.00 to	18.00
Bundled sheets	13.00 to	13.50
Heavy turnings	8.50 to	9.00
Rerolling rails	....	21.00
Steel car axles	....	23.50
Steel rails under 3 ft.	....	21.50
Steel angle bars	19.00 to	19.50
Cast iron car wheels	....	20.00
No. 1 machinery cast	....	20.00
Railroad malleable	20.00 to	20.50
Breakable cast	....	16.50
Stove plate	....	17.00
Grate bars	....	15.25
Brake shoes	....	15.25

Note: Cast grades f.o.b. Shipping Point.

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to	$15.00
No. 2 hvy. melting	13.50 to	14.00
No. 2 bundles	12.50 to	13.00
No. 1 busheling	11.50 to	12.00
Scrap rails	14.00 to	14.50
Rails for rerolling	17.00 to	17.50
Rails 3 ft. & under	17.00 to	17.50
Angles & splice bars	16.50 to	17.00
Long turnings	4.50 to	5.00
Cast iron borings	6.50 to	7.00
Steel axles	14.50 to	15.00
Stove plate	16.50 to	17.00
Bar crops and plate	16.00 to	16.50
Structural and plate	16.00 to	16.50
No. 1 cast	20.00 to	21.00
Cast iron carwheels	13.00 to	13.50

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.00 to	$16.50
No. 2 hvy. melting	16.00 to	16.50
Low phos. plate	17.00 to	18.00
No. 1 busheling	16.00 to	16.50
Hydraulic bundles	16.00 to	16.50
Mach. shop turnings	9.00 to	9.50
Short shovel. trngs.	11.00 to	11.50
Cast iron borings	10.00 to	10.50

NEW YORK

Dealers' buying prices, per gross ton, on cars:

No. 1 hvy. melting	$11.50 to	$12.00
No. 2 hvy. melting	10.50 to	11.00
Hyd. comp. black bundles	9.50 to	10.00
Hyd. comp. galv. bundles	7.50 to	8.00
Hvy. breakable cast	....	16.50
Charging box cast	....	19.00
No. 1 cupola cast	....	20.00
Clean auto cast	....	20.00
Unstrip. motor blks.	....	17.50
Stove plate	....	19.00
Clean chem. cast bor.	....	14.33
Mach. shop turnings	6.00 to	6.50
Mixed bor. & turns.	6.00 to	6.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.50 to	$17.00
No. 1 bundles	15.00 to	15.50
No. 2 bundles	14.00 to	14.50
No. 2 hvy. melting	15.00 to	15.50
Mach. shop turnings	9.00 to	9.50
Shoveling turnings	11.00 to	11.50
Cast iron borings	11.00 to	11.50
Mixed bor. & turns.	11.00 to	11.50
No. 1 cupola cast	20.80 to	22.50
Stove plate	19.80 to	21.60
Low phos. plate	....	21.75
Scrap rails	19.00 to	19.25
Rails 3 ft. & under	....	22.75
RR steel wheels	....	23.75
Cast iron car wheels	....	20.00
RR coil & leaf sprgs.	....	23.75
RR knuckles & coup.	....	23.75
RR malleable	....	22.00
No. 1 busheling	15.00 to	15.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.50 to	$16.00
No. 2 hvy. melting	15.50 to	16.00
Compressed sheet stl.	15.50 to	16.00
Drop forge flashings	15.50 to	16.00
No. 2 bundles	14.50 to	15.00
Mach. shop turnings	6.50 to	7.50
Short shovel. trngs.	11.00 to	12.00
No. 1 busheling	15.00 to	15.50
Steel axle turnings	15.00 to	15.50
Low phos. billet and bloom crops	20.00 to	21.00
Cast iron borings	11.00 to	12.00
Mixed bor. & turns.	11.00 to	11.50
No. 2 busheling	13.00 to	13.50
No. 1 machine cast	20.00 plus frt.	
Railroad cast	20.00 plus frt.	
Railroad grate bars		15.25
Stove plate	19.00 plus frt.	
RR. hvy. melting	17.00 to	17.50
Rails 3 ft. & under	....	23.00
Rails 18 in. & under		24.25
Rails for rerolling		23.50
Railroad malleable	22.00 plus frt.	
Elec. furnace punch.	18.50 to	19.50

SAN FRANCISCO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.00 to	$16.75
RR hvy. melting	16.00 to	16.75
No. 2 hvy. melting	15.00 to	15.75
No. 2 bales	14.00 to	14.75
No. 3 bales	10.50 to	11.25
Mach. shop turnings		7.00
Elec. furn. 1 ft., under	16.00 to	17.50
No. 1 cupola cast	21.00 to	23.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to	$16.00
No. 2 hvy. melting	14.00 to	15.00
No. 2 bales	13.00 to	14.00
No. 3 bales	10.00 to	10.50
Mach. shop turnings	....	5.00
No. 1 cupola cast	20.00 to	23.00

SEATTLE

Per gross ton delivered to consumer:

No. 1 hvy. melting	$13.50 to	$14.50
RR hvy. melting	13.50 to	14.50
No. 3 bundles	....	11.50
Elec. furn. 1 ft., under	....	17.00
No. 1 cupola cast	20.00 to	22.00

Comparison of Prices . . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. (Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	Oct. 17, 1944	Oct. 10, 1944	Sept. 12, 1944	Oct. 19, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Oct. 17, 1944	Oct. 10, 1944	Sept. 12, 1944	Oct. 19, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh	$16.25	$16.25	$18.25	$20.00
Heavy melt'g steel, Phila.	14.50	14.50	17.00	18.75
Heavy melt'g steel, Ch'go	*16.50*	17.50	18.75	18.75
No. 1 hy. comp. sheet, Det.	11.25	11.25	14.75	17.85
Low phos. plate, Youngs'n	*17.50*	18.00	20.50	22.50
No. 1 cast, Pittsburgh	20.00*	20.00*	22.50	20.00
No. 1 cast, Philadelphia	20.00*	20.00*	20.00	20.00
No. 1 cast, Chicago	20.00*	20.00*	22.17	20.00

*F.o.b. shipping point.

Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium. ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 166-177.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
October 17, 1944	2.25513c. a Lb.	23.61 a Gross Ton	*$15.75* a Gross Ton
One week ago	2.25513c. a Lb.	23.61 a Gross Ton	$16.08 a Gross Ton
One month ago	2.25513c. a Lb.	23.61 a Gross Ton	$18.84 a Gross Ton
One year ago	2.26190c. a Lb.	23.61 a Gross Ton	$19.17 a Gross Ton

	HIGH	LOW	HIGH	LOW	LOW	HIGH
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$19.17, Apr. 10	$22.00, Jan. 7
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	16.04, Apr. 9	21.83, Dec. 30
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	14.08, May 16	22.50, Oct. 3
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	11.00, June 7	15.00, Nov. 22
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	12.67, June 8	21.92, Mar. 30
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	12.67, June 9	17.75, Dec. 21
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	10.33, Apr. 29	13.42, Dec. 10
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	9.50, Sept. 25	13.00, Mar. 13
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	6.75, Jan. 3	12.25, Aug. 8
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	6.43, July 5	8.50, Jan. 12
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	8.50, Dec. 29	11.33, Jan. 6
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	11.25, Dec. 9	15.00, Feb. 18
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	14.08, Dec. 3	17.58, Jan. 29

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

80% SAVING
IN CUTTING OIL
COSTS
CUTTING OIL COSTS reduced 80% at the Gellman Manufacturing Co., Rock Island, Illinois, after installation of Tolhurst Chip Wringers.

..Up to 98.6% cutting oil being reclaimed from metal chips

VALUABLE HIDDEN CUTTING OIL in metal chips is reclaimed through the application of centrifugal force. A plentiful daily supply of fresh, reclaimed cutting oil results in its conscientious use by machine operators.

50% INCREASE IN TOOL LIFE has been shown in many tool room records after installing Tolhurst equipment. Tools require less up-keep and fewer resharpenings, consequently production goes on uninterrupted.

OPERATED BY UNSKILLED HELP The routine is simple and rapid. A Tolhurst system of cutting oil recovery raises the standards of plant "housekeeping" because floors are kept cleaner. Also, fire hazards are reduced. Clean chips bring higher scrap metal prices.

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"Since 1852 — CENTRIFUGAL MAKERS FOR THE PROCESS INDUSTRIES"

Finished Iron and Steel Prices . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Provo, Utah	Pacific Ports, Cars[10]	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)						2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)						3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10						5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60							
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75							
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢		2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢		2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢		2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢		c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)				(Toledo = 2.80¢)			2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massilon, Canton = 2.70¢)						2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.60¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢		4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢		4.15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢			2.45¢		2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R[11] 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)									
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)									
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)									
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)									
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)				3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)						3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72 ¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47; Pgh. Steel Co. (reroll) $38.25, (forging) $44.25. Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth.

Sheet bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill. Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2 $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich. Geneva Steel Co. $58.64 f.o.b. Pac. C. Pgh. Steel Co. $43.50.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron and Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. $2.75 f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel Corp., Benwood, $2.05 per cwt.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago, base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Sulphite-Treated
Alloy and Special Steels

BENEFITS TO USERS

- ✓ 25% Greater Machining Speed
- ✓ 200% Longer Tool Life
- ✓ Fewer Rejections
- ✓ More Uniform Physical Properties
- ✓ Fewer Operations
- ✓ Better Finished Product

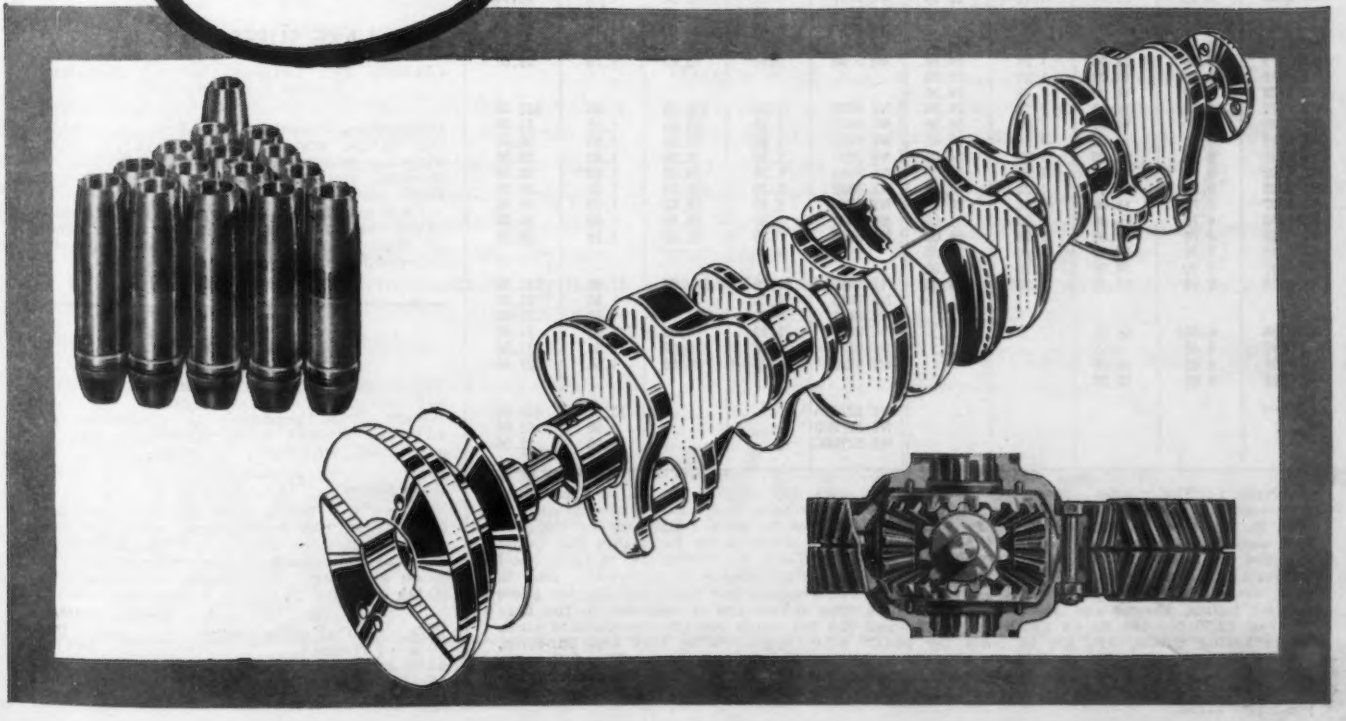
SULPHITE-TREATED alloy and special steels, which we have produced for a number of years, have solved many problems for steel users. They have been most satisfactorily applied where machinability is of first importance.

Sulphite treatment can be applied to most types of steel. It has been used successfully in the production of shells, crankshafts, camshafts, axles, and gears.

If you believe that your company may have an application for sulphite-treated steels, our sales and metallurgical staffs are at your service. We have accomplished satisfactory results for others and are ready to serve you in the same way.

WISCONSIN STEEL COMPANY

Affiliate of International Harvester Company
General Offices: 180 North Michigan Avenue, Chicago 1, Illinois



WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	3.518	4.872[a]	5.018a	3.922	4.772	3.605	3.666	3.822	4.072	5.968	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.004	3.70	4.65[917]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257[4]	3.86	4.35[17]	3.811[3]	3.811[3]	3.761[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	8.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.171[8]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

MILL EXTRAS FOR NATIONAL EMERGENCY STEELS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 1330	0.10¢	$2.00	....	.....	NE 9415	0.75¢	$15.00	$1.25	$25.00
NE 1335	0.10	2.00	....	.....	NE 9417	0.75	15.00	1.25	25.00
NE 1340	0.10	2.00	....	.....	NE 9420	0.75	15.00	1.25	25.00
NE 1345	0.10	2.00	....	.....	NE 9422	0.75	15.00	1.25	25.00
NE 1350	0.10	2.00	....	.....	NE 9425	0.75	15.00	1.25	25.00
					NE 9427	0.75	15.00	1.25	25.00
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8627	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00					
NE 8637	0.65	13.00	1.15	23.00	NE 9722	0.65¢	$13.00	$1.15	$23.00
NE 8640	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8642	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9742	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9745	0.65	13.00	1.15	23.00
					NE 9747	0.65	13.00	1.15	23.00
NE 8712	0.70¢	$14.00	$1.20	$24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00					
NE 8722	0.70	14.00	1.20	24.00	NE 9830	$1.30	$26.00	$1.80	$36.00
NE 8725	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8727	0.70	14.00	1.20	24.00	NE 9935	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00					
NE 8747	0.70	14.00	1.20	24.00	NE 9912	$1.20	$24.00	$1.55	$31.00
NE 8750	0.70	14.00	1.20	24.00	NE 9915	1.20	24.00	1.55	31.00
					NE 9917	1.20	24.00	1.55	31.00
NE 9255	0.40¢	$8.00	....	.....	NE 9920	1.20	24.00	1.55	31.00
NE 9260	0.40	8.00	....	.....	NE 9922	1.20	24.00	1.55	31.00
NE 9261	0.65	13.00	....	.....	NE 9925	1.20	24.00	1.55	31.00
NE 9262	0.65	13.00	....	.....					
					NE 52100A	....	.....	$2.60	$52.00
					NE 52100B	....	.....	2.60	52.00
					NE 52100C	....	.....	2.60	52.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip, and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; **NE** alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

([a]) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

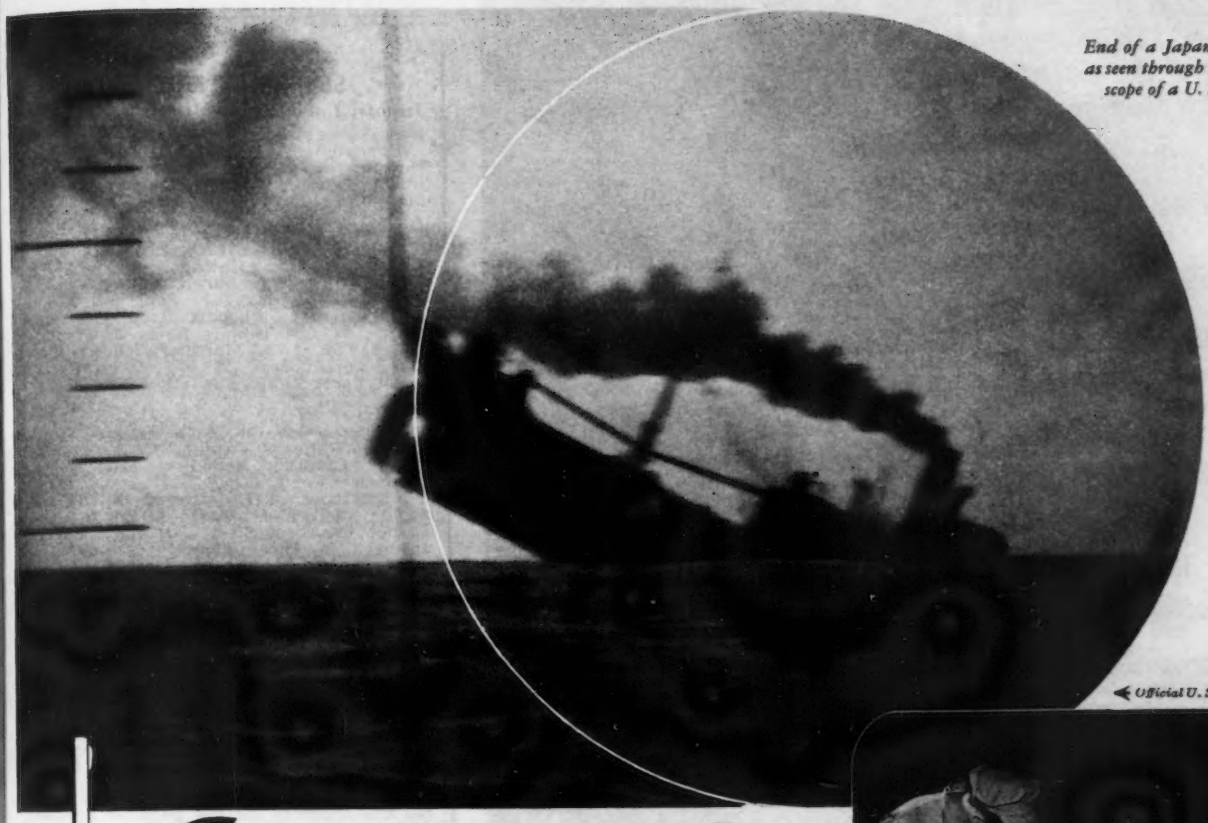
FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00



End of a Japanese ship as seen through the periscope of a U. S. sub

◀ *Official U. S. Navy Photograph*

Swallowed:

One "tin fish" that wouldn't digest!

NOW—while you read these words—somewhere in the Pacific a U. S. submarine is silently, relentlessly stalking a Japanese ship. Suddenly, that ship will swallow a "tin fish" it cannot digest. And Uncle Sam's Navy will add one more victim to the *hundreds* of Jap ships already sunk!

Streamlined, point-nosed torpedoes—"tin fish" to the sub man—must be made to watch-like specifications for this important work of turning the Japanese fleet bottoms up. At the Naval Torpedo Station, Newport, Rhode Island, one of these specifications calls for painting torpedo flasks not only outside, but also *inside* . . . to protect delicate internal mechanisms against corrosion. A real challenge—considering the fact that these flasks are of one-piece design!

How, then, is it done? In a modern DeVilbiss water-wash spray booth the tubes are rotated by a special device while their far insides are spray-painted by automatic equipment. Then standard DeVilbiss spray guns with extensions are manually directed to paint inside areas near the ends of each flask.

Here, a combination of automatic and manual spray equipment proved to be the only solution. In countless other applications automatic and manual DeVilbiss spray systems are working independently to help makers of war materiel obtain better painting and coating results—*in less time.* A survey of your individual requirements will enable us to recommend the type of DeVilbiss equipment that will give you these same results—in producing for war or peace.

THE DEVILBISS COMPANY, TOLEDO 1, OHIO

Canadian Plant: Windsor, Ontario

DE VILBISS

Spray Systems

SPRAY EQUIPMENT • EXHAUST SYSTEMS • AIR COMPRESSORS • HOSE & CONNECTIONS

Materials handling, common to every production, storage and shipping operation, is accomplished most efficiently by versatile equipment capable of performing many different handling assignments—

such as **TOWMOTOR**

THE 24-HOUR ONE-MAN-GANG

TOWMOTOR CORPORATION • 1230 E. 152ND STREET, CLEVELAND 10, OHIO

STRAIGHT—GAS POWERED INDUSTRIAL TRUCKS EXCLUSIVELY—SINCE 1919

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton $54.00

Price delivered Detroit $2.00 higher; E. Michigan, $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.

Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

TURNING YEARS INTO HOURS

IN PREPARATION FOR

AMERICA'S GREATEST INDUSTRIAL ERA

With eager markets waiting for many products, time is the most valuable commodity in turning to consumer production.

Many of the war born developments, designs and production short cuts here at Pollak will save time and expense for American manufacturers in the future.

We have discussed them with many executives and engineers, and as a result, we have a number of mechanical parts and complete assemblies awaiting material and manpower releases.

But Pollak capacity is large. Five plants and nearly 5000 employees will enable us to absorb the development, designing and manufacture of still more metal products.

Pollak experience, and techniques in metal working, particularly the less common metals, will help you condense years into hours—if we can serve you. Let us plan with you to make Pollak facilities your facilities to save time and money.

POLLAK
PRECISION
PRODUCTS

POLLAK MANUFACTURING COMPANY

Arlington, New Jersey

DEVELOPING • DESIGNING • MACHINE WORK • SPINNING • WELDING • STAMPING • FINISHING

VISIT THE UDYLITE EXHIBIT
D628-D632—NATIONAL METAL
EXPOSITION—CLEVELAND

● Udylite Metal Finishing Supplies are the finest available—dependable, efficient, carefully tested and approved in our own laboratories under actual plant conditions before they are offered to you.

When you buy Udylite supplies you buy a share in one of the finest staffs of engineers and electrochemists in the country. These men know metal finishing from A to Z and their combined "know-how" is at your service to solve any finishing problems you may have. They'll not only put you right but they'll keep you that way by constant check and control if you wish. *There,* is something money cannot buy. It's Udylite's plus value at no extra cost.

THE UDYLITE CORPORATION

1651 E. Grand Blvd., Detroit 11, Mich.

Chicago 12, 1943 Walnut Street
Long Island City 1, N. Y., 11-16 44th Drive
Cleveland 3, 4408 Carnegie Ave.

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe) Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	....
	Base per 100 lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts

	Consumer
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

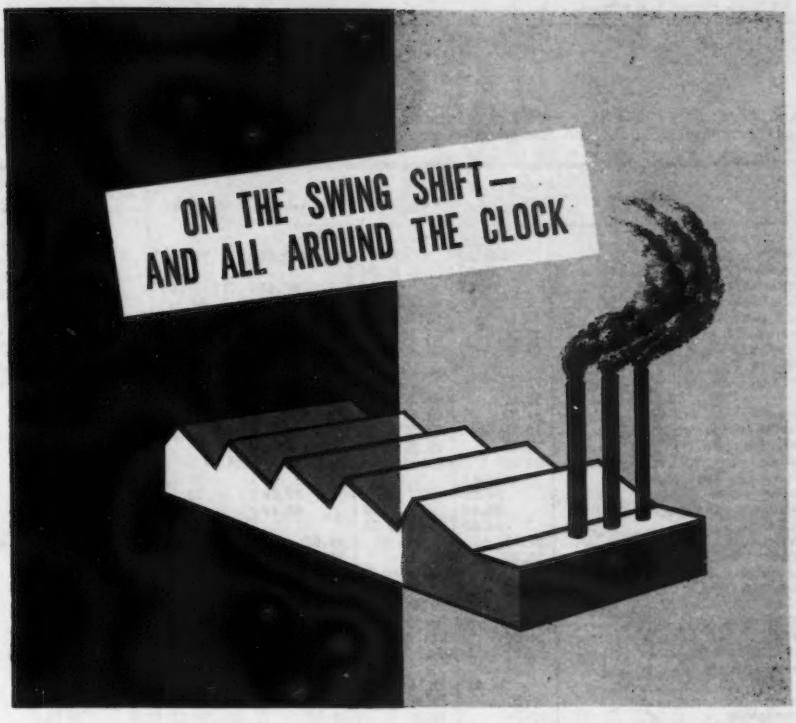
Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20 lb. coating I.C.	7.50	15.00



WYANDOTTE METAL CLEANERS—every one a specialist—are in there swinging these days, meeting every kind of metal cleaning task.

On the job, too, is the Wyandotte Field Engineer, using his technical skill and knowledge to make his products save time, money, labor and rejects in all kinds of metal-cleaning operations. He has a metal cleaner to fill your needs — for cleaning after machining and prior to plating, painting, lacquering, blackening, anodizing or spot-welding operations.

See for yourself how quickly these specialized cleaners make away with even the toughest metal cleaning and degreasing jobs. Yet, you don't have to worry about spoiling even the most delicate surface.

The Wyandotte Representative will be glad to study your process and show you how his products can aid your production. His advice is yours for the asking.

Wyandotte
REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION • J. B. Ford Division
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

PIG IRON

All prices set in bold face type are maximum established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*		*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50		24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	*26.13*	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron & Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorus iron; high phosphorus sells for $28.50 at the furnace.

(3) E. & G. Brooke Co., Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh, 11½ to 12½c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges.

ETNA

A client of ours had a job of pointing heavy-walled copper tubing, and wanted to speed up the operation. Just how to do it didn't appear on the horizon, and so they did the safe and logical thing—they put their swaging job up to Etna.

The answer to that problem is illustrated on this page. It's a modern Etna Swaging Machine that points *more* copper tubes per hour in less time at less cost. If you have a problem involving tapering or reducing tubing and solid rounds—ask Etna about it.

Etna has the swaging machines from ⅜" to 4" and the experience to help you get the most out of this type of machine.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING... "Ask ETNA About Swaging"

ETNA MACHINE COMPANY
TOLEDO OHIO

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Sec. quality, New Jersey	51.00
No. 1 Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00

Chrome Brick

	Per Net ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plate, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F. Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PERFORATED METALS
INDUSTRIAL and ORNAMENTAL
To produce the highest quality of perforated metal as used in the industrial arts and for ornamentation has been the ambition and persistent endeavor of this company. The highest quality best serves the user. We are here to serve you.

ANY METAL • ANY PERFORATION

The Harrington & King PERFORATING CO.

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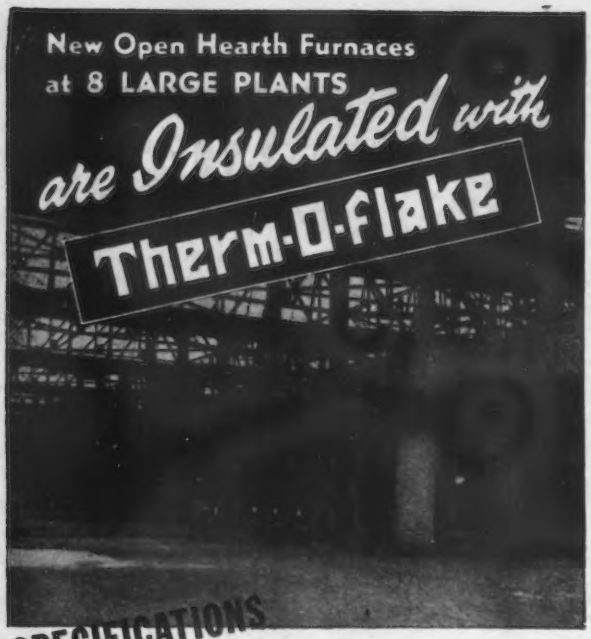
Eastern Office, 114 Liberty Street, New York 6, N. Y.

Fast Tough
MARVEL
Heavy feed at high speed!
Heavy feed at high speed spells doom to the ordinary hack saw blade; down-time for your machine, extra expense in money, man hours, and production. The MARVEL Hack Saw Blade, because it is positively unbreakable under these conditions, should be "a must" tool in every efficiently operated shop. A tough alloy steel back is electrically welded to high speed steel teeth, producing a blade that can be pulled to almost unlimited tension; can withstand extra heavy feeds and the heat and abrasion of high speed heavy duty sawing.
The same exclusive unbreakable feature of MARVEL Hack Saw Blades is also a feature of MARVEL Hole Saws, giving these saws the ability to stand up under abuse. MARVEL Hole Saws cut holes from 5/8" to 4 1/2" diameter in stock up to 1 1/8" thick. Usable in portable drill, drill press, or lathe tail stock.
(HIGH-SPEED-EDGE) MARVEL

Complete Range of Metal Sawing Machines
Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course)

ARMSTRONG-BLUM MFG. CO.
5700 W. Bloomingdale Ave., Chicago 39, Illinois, U.S.A.



SPECIFICATIONS
for Greater Fuel Economy
Improved Working Conditions

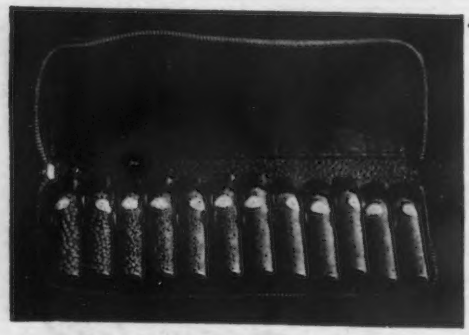
Therm-O-Flake Coating Vertical walls — bulkheads — roofs — arches.

Therm-O-Flake Brick Flue Walls and Arch — Checker Chamber Walls. Slag Pocket Walls.

Therm-O-Flake Concrete Flue — Checker Chamber Hearth Bottoms.

Illinois Clay Products Company
JOLIET, ILL.

High Temperature
INSULATION



HEAT-TREATED STEEL SHOT

We manufacture shot and grit for endurance

A shot or grit that will blast fast with a clean finish.

This is the only reason why so many operators are daily changing to our shot and grit, from Maine to California.

The unprecedented demand for our—

Heat-Treated Steel Shot and Heat-Treated Steel Grit

has enabled us to expand our production and maintain a quality that is more than satisfactory to our hundreds of customers all over the country.

HARRISON ABRASIVE CORPORATION
Manchester, New Hampshire

HEAT-TREATED STEEL GRIT

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(C/L, Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	$1.50
Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5	$1.10
Ferroboron, contract basis, 17.50% min., Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.	
2000 lb. to carload	$1.20
Under 2000 lb.	1.30
Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots	$2.25
Under 2000 lb. lots	$2.30
Ferrotitanium, 40%-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti	$1.23
Less ton lots	$1.25
Ferrotitanium, 20%-25%, 0.10%C. max., ton lots, per lb. contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload	$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo.	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.75c.
Ton lots	9.25c.

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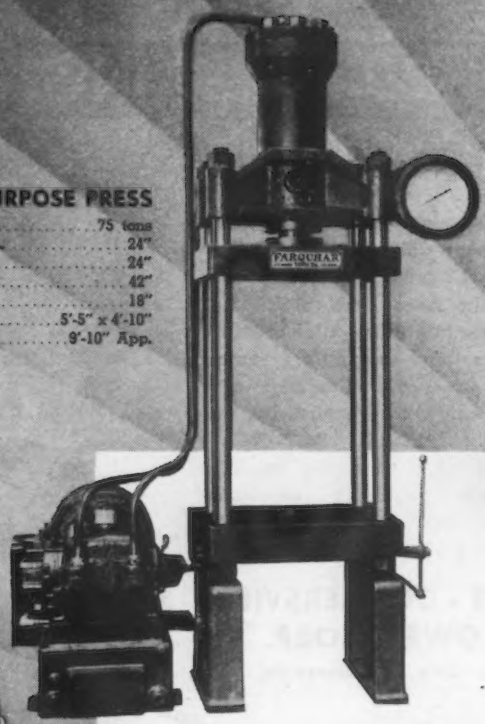
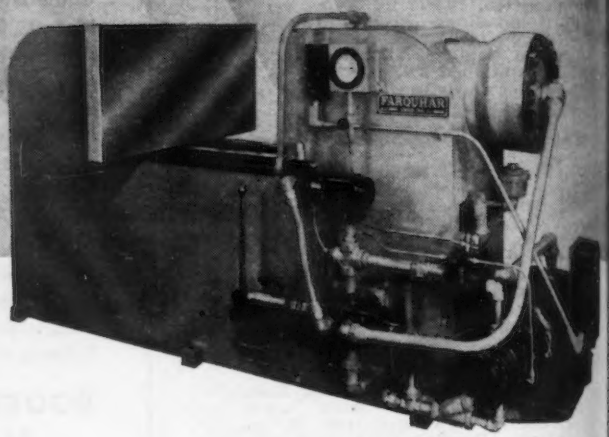


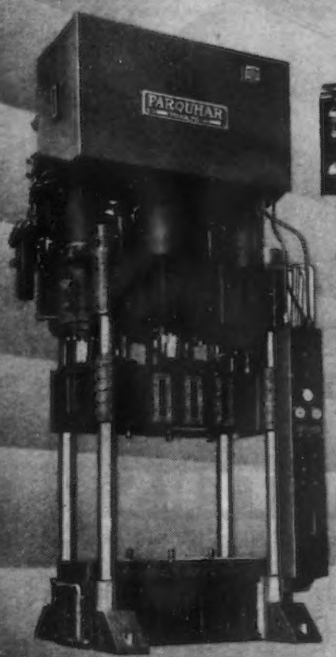
75 TON GENERAL PURPOSE PRESS

Capacity	75 tons
Clear between columns R. to L.	24"
Bed, F. to B.	24"
Daylight	42"
Stroke	18"
Floor Space	5'-5" x 4'-10"
Overall Height	9'-10" App.
20 H.P. Motor	
Oilgear Pump	

100 TON HORIZONTAL GAP PRESS

Capacity	100 tons
Gap	13½"
Bed Size	23" x 4'-0"
Opening	22½"
Stroke	22½"
Floor to ℄ of Platen	48½"
Floor Space	10'-0" x 4'-6"
Overall Height	5'-0"
10 H.P. Motor	





750 TON SETTING PRESS

Capacity	750 tons
Clear between columns, L. to R.	72"
Bed, F. to B.	42"
Daylight	64"
Stroke	36"
Top & Bottom Ejectors	
Floor Space	8'-6" x 10'-0"
Overall Height	21'-9"
125 H.P. Motor	

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FOR EVERY HYDRAULIC PRESS

When your processes require self-contained hydraulic production presses, call on Farquhar for help. The units shown here are but a few of the types and sizes we have built for every industrial purpose. Ranging from 3 to 7,200 ton capacities, Farquhar Presses serve in such varied spots as food industry, metal working, ceramics, laminating, powder metallurgy, dehydration and many allied tasks. Our experienced engineers will be glad to consult and advise with you on any problem, old or new, that involves hydraulic production presses. Your query will receive prompt attention.

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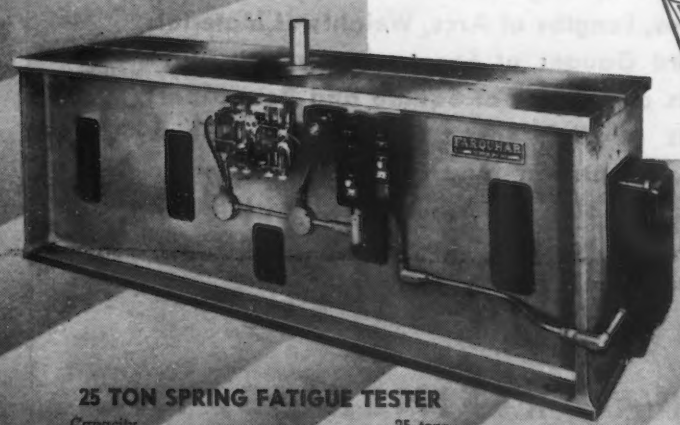
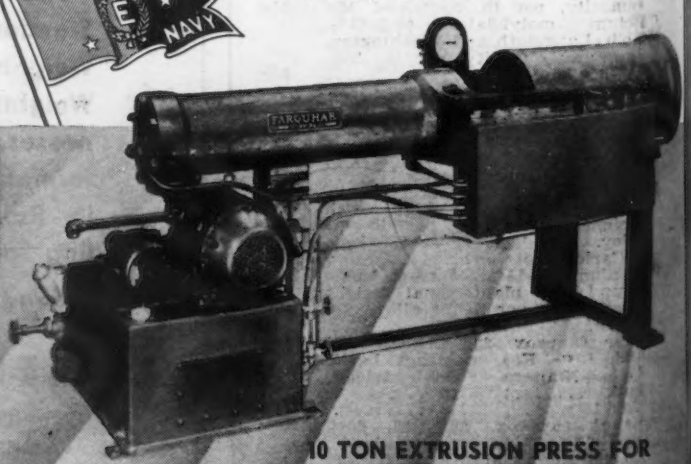


25 TON SPRING FATIGUE TESTER

Capacity	25 tons
Table { L. to R.	8'-9"
Table { F. to B.	2'-6¾"
Stroke	4"
Floor to Table	34"
Floor Space	6'-8" x 4'-6"
20 H.P. Motor	



10 TON EXTRUSION PRESS FOR SOFT MATERIALS

Capacity	10 tons
Material C. & L.	.14" Dia. x 2'-9" lg.
Stroke	35"
Floor to ℄ of Press	36"
Floor Space	2'-0" x 3'-0"
3 H.P. Motor	